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ON

AGRICULTURE IN INDIA

Volume VIII

EVIDENCE

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TERMS OF REFERENCE

Generally,

To examine and report on the present conditions of agriculture rural economy in British India and to make recommendations for improvement of agriculture and the promotion of the welfare prosperity of the rural population;

In particular to investigate—

(*a*) the measures now being taken for the promotion of agricult and veterinary research, experiment, demonstration and ed tion, for the compilation of agricultural statistics, for the in duction of new and better crops and for improvement in agri tural practice, dairy farming and the breeding of stock;

(*b*) the existing methods of transport and marketing of agricult produce and stock;

(*c*) the methods by which agricultural operations are financed credit afforded to agriculturists;

(*d*) the main factors affecting rural prosperity and the welfare of agricultural population;

and to make recommendations.

It will not be within the scope of the Commission's duties to m recommendations regarding the existing system of landownership tenancy or of the assessment of land revenue and irrigation charge the existing division of functions between the Government of India the local Governments. But the Commission shall be at liberty to sug means whereby the activities of the Governments in India may bes co-ordinated and to indicate directions in which the Governmen India may usefully supplement the activities of local Governments.

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INTERIM REPORT.

To

THE KING'S MOST EXCELLENT MAJESTY.

May It Please Your Majesty,

We, the Commissioners appointed to examine and report on the present conditions of agricultural and rural economy in British India, and to make recommendations for the improvement of agriculture and to promote the welfare and prosperity of the rural population; in particular, to investigate :—(*a*) the measures now being taken for the promotion of agricultural and veterinary research, experiment, demonstration and education, for the compilation of agricultural statistics, for the introduction of new and better crops and for improvement in agricultural practice, dairy farming and the breeding of stock; (*b*) the existing methods of transport and marketing of agricultural produce and stock; (*c*) the methods by which agricultural operations are financed and credit afforded to agriculturists; (*d*) the main factors affecting rural prosperity and the welfare of the agricultural population; and to make recommendations; availing ourselves of Your Majesty's permission to report our proceedings from time to time, desire to submit to Your Majesty the minutes of the evidence which we have taken in respect of the Punjab on the subject of our Inquiry.

All of which we most humbly submit for Your Majesty's most gracious consideration.

(Signed) LINLITHGOW,
Chairman.
(,,) H. S. LAWRENCE.
(,,) T. H. MIDDLETON.
(,,) J. MACKENNA.
(,,) H. CALVERT.
(,,) N. GANGULEE.
(,,) L. K. HYDER.
(,,) B. S. KAMAT.

(Signed) J. A. MADAN,
(,,) F. W. H. SMITH,
Joint Secretaries.

25th July, 1927.

QUESTIONNAIRE

PART I

Question.

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3. Demonstration and propaganda.
4. Administration.
5. Finance.
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7. Fragmentation of holdings.

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8. Irrigation.
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10. Fertilisers.
11. Crops.
12. Cultivation.
13. Crop protection.
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15. Veterinary.
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17. Agricultural industries.
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20. Marketing.
21. Tariffs and sea freights.
22. Co-operation.
23. General education.
24. Attracting capital.
25. Welfare of rural population.
26. Statistics.

QUESTIONNAIRE

PART I

1. Research.

(*a*) Have you suggestions to advance for the better organisation, administration and financing of—

(*i*) All research affecting the welfare of the agriculturist, including research into the scientific value of the indigenous theory and traditional methods of agriculture,

(*ii*) Veterinary research ?

(*b*) If in cases known to you progress is not being made because of the want of skilled workers, or field or laboratory facilities for study or by reason of any other handicaps, please give particulars. [Suggestions of a general kind should be made under (*a*) ; answers under this heading should relate to specific subjects. The purpose is to secure a list of the problems met with by scientific investigators in the course of their work which are being held over because of lack of resources or deficient organisation.]

(*c*) Can you suggest any particular subject for research not at present being investigated to which attention might usefully be turned ?

2. Agricultural Education.

With reference to any form of agricultural education of which you may have experience, please state your views on the following :—

(*i*) Is the supply of teachers and institutions sufficient ?

(*ii*) Is there an urgent need for extension of teaching facilities in any district or districts known to you personally ?

(*iii*) Should teachers in rural areas be drawn from the agricultural classes ?

(*iv*) Are the attendances at existing institutions as numerous as you would expect in present circumstances ; if not, state reasons. Can you suggest measures likely to stimulate the demand for instruction ?

What are the main incentives which induce lads to study agriculture ?

Are pupils mainly drawn from the agricultural classes ?

Are there any modifications in existing courses of study which appear to be called for ; if so, what are they ?

What are your views upon (*a*) nature study ; (*b*) school plots ; (*c*) school farms ?

What are the careers of the majority of students who have studied agriculture ?

How can agriculture be made attractive to middle class youths ?

Are there recent movements for improving the technical knowledge of students who have studied agriculture ?

(*c*) What measures should Government take to encourage the reclamation of areas of cultivable land which have gone out of cultivation ?

10. Fertilisers.

(*a*) In your opinion, could greater use be profitably made of natural manures or artificial fertilisers ? If so, please indicate the directions in which you think improvement possible.

(*b*) Can you suggest measures to prevent the fraudulent adulteration of fertilisers ?

(*c*) What methods would you employ to popularise new and improved fertilisers ?

(*d*) Mention any localities known to you in which a considerable increase in the use of manures has recently taken place.

(*e*) Has effect of manuring with phosphates, nitrates, sulphate of ammonia, and potash manures been sufficiently investigated ? If so, what is the result of such investigation ?

(*f*) What methods would you employ to discourage the practice of using cowdung as fuel ?

11. Crops.

(*a*) Please give your views on—

(*i*) the improvement of existing crops,

(*ii*) the introduction of new crops including fodder crops,

(*iii*) the distribution of seeds,

(*iv*) the prevention of damage by wild animals.

(*b*) Can you suggest any heavy yielding food crops in replacement of the present crops ?

(*c*) Any successful efforts in improving crops or substituting more profitable crops which have come under your own observation should be mentioned.

12. Cultivation.

Can you suggest improvements in—

(*i*) the existing system of tillage, or

(*ii*) the customary rotations or mixtures of the more important crops ?

13. Crop Protection, Internal and External.

Please give your views on—

(*i*) The efficacy and sufficiency of existing measures for protection of crops from external infection, pests and diseases.

(*ii*) The desirability of adopting internal measures against infection.

14. Implements.

(*a*) Have you any suggestion for the improvement of existing, or the introduction of new, agricultural implements and machinery ?

(*b*) What steps do you think may usefully be taken to hasten the adoption by the cultivator of improved implements ?

(*c*) Are there any difficulties which manufacturers have to contend with in the production of agricultural implements or their distribution for sale throughout the country ? If so, can you suggest means by which these difficulties may be removed ?

Part III

15. Veterinary.

(*a*) Should the Civil Veterinary Department be under the Director of Agriculture or should it be independent ?

(*b*) (*i*) Are dispensaries under the control of Local (District) Boards ? Does this system work well ?

(*ii*) Is the need for expansion being adequately met ?

(*iii*) Would you advocate the transfer of control to Provincial authority ?

(*c*) (*i*) Do agriculturists make full use of the veterinary dispensaries ? If not, can you suggest improvements to remedy this ?

(*ii*) Is full use made of touring dispensaries ?

(*d*) What are the obstacles met with in dealing with contagious diseases ? Do you advocate legislation dealing with notification, segregation, disposal of diseased carcases, compulsory inoculation of contacts and prohibition of the movement of animals exposed to infection ? Failing legislation, can you suggest other means of improving existing conditions ?

(*e*) Is there any difficulty in securing sufficient serum to meet the demand ?

(*f*) What are the obstacles in the way of popularising preventive inoculation ? Is any fee charged, and, if so, does this act as a deterrent ?

(*g*) Do you consider that the provision of further facilities for research into animal disease is desirable ?

If so, do you advocate that such further facilities should take the form of—

(*i*) an extension of the Muktesar Institute, or

(*ii*) the setting up, or extension of, Provincial Veterinary Research Institutions ?

(*h*) Do you recommend that special investigations should be conducted by—

(*i*) officers of the Muktesar Institute, or

(*ii*) research officers in the Provinces ?

(*i*) Do you recommend the appointment of a Superior Veterinary Officer with the Government of India ? What advantages do you expect would result from such an appointment ?

16. Animal Husbandry.

(*a*) Do you wish to make suggestions for—

(*i*) improving the breeds of livestock,

(*ii*) the betterment of the dairying industry,

(*iii*) improving existing practice in animal husbandry ?

(*xii*) How can adult education in rural tracts be popularised ?

(*xiii*) In suggesting any scheme for better educational facilities in rural areas, please give your views for (*a*) its administration and (*b*) its finance.

3. Demonstration and Propaganda.

(*a*) What are the measures which in your view have been successful in influencing and improving the practice of cultivators ?

(*b*) Can you make suggestions for increasing the effectiveness of field demonstrations ?

(*c*) Can you suggest methods whereby cultivators may be induced to adopt expert advice ?

(*d*) If you are aware of any striking instances of the success or the failure of demonstration and propaganda work, please give particulars and indicate the reasons for success or for failure.

4. Administration.

(*a*) Do you wish to suggest means towards the better co-ordination of the activities of the Governments in India or to indicate directions in which the Government of India may usefully supplement the activities of the local Governments ?

(*b*) Is it your opinion that the expert scientific knowledge required in the development of agriculture in the different Provinces could be supplied to a greater extent than is the case at present by increasing the scientific staff of the Government of India ? If so, indicate the types of work which would benefit by pooling the services of experts, and suggest how that work should be controlled.

(*c*) Are you satisfied from the agricultural standpoint with the services afforded by—

(*i*) The Agricultural and Veterinary Services,
(*ii*) Railways and steamers,
(*iii*) Roads,
(*iv*) Meteorological Department,
(*v*) Posts, and
(*vi*) Telegraphs, including wireless ?

If not, please indicate directions in which you think these Services might be improved or extended.

5. Finance.

(*a*) What are your views as to the steps that should be taken for the better financing of agricultural operations and for the provision of short and long-term credit to cultivators ?

(*b*) Do you wish to suggest means whereby cultivators may be induced to make fuller use of the Government system of *taccavi* ?

6. Agricultural Indebtedness.

(*a*) What in your opinion are :—

(*i*) the main causes of borrowing,
(*ii*) the sources of credit, and
(*iii*) the reasons preventing repayment.

6

(*b*) What measures in your opinion are necessary for lightening agriculture's burden of debt ? For example, should special measures be taken to deal with rural insolvency, to enforce the application of the Usurious Loans Act, or to facilitate the redemption of mortgages ?

(*c*) Should measures be taken to restrict or control the credit of cultivators such as limiting the right of mortgage and sale ? Should non-terminable mortgages be prohibited ?

7. Fragmentation of Holdings.

(*a*) Do you wish to suggest means for reducing the loss in agricultural efficiency attendant upon the excessive subdivision of holdings ?

(*b*) What are the obstacles in the way of consolidation and how can they be overcome ?

(*c*) Do you consider legislation to be necessary to deal with minors, widows with life interest, persons legally incapable, alienation and dissentients, and to keep disputes out of the courts ?

PART II

8. Irrigation.

(*a*) Name any district or districts in which you advocate the adoption of new irrigation schemes, or suggest extensions or improvements in the existing systems or methods of irrigation by—

(*i*) Perennial and non-perennial canals,
(*ii*) Tanks and ponds,
(*iii*) Wells.

What are the obstacles in your district or Province to the extension of irrigation by each of the above methods ?

(*b*) Are you satisfied with the existing methods of distributing canal water to cultivators ? Describe the methods that have been employed to prevent wastage of water by evaporation and by absorption in the soil. What form of outlet for distribution to cultivators at the tail end do you regard as the most equitable and economical ? Have these methods and devices been successful, or do you wish to suggest improvements ?

(*N.B.*—Irrigation charges are *not* within the terms of reference of the Commission, and should not be commented upon.)

9. Soils.

(*a*) Have you suggestions to make—

(*i*) for the improvement of soils, whether by drainage or other means, not dealt with under other headings in this questionnaire.
(*ii*) for the reclamation of Alkali (Usar) or other uncultivable land,
(*iii*) for the prevention of the erosion of the surface soil by flood water ?

(*b*) Can you give instances of soils known to you which, within your recollection, have—

(*i*) undergone marked improvement,
(*ii*) suffered marked deterioration ?

If so, please give full particulars.

(*b*) Comment on the following as causes of injury to cattle in your district—

(*i*) Overstocking of common pastures,

(*ii*) Absence of enclosed pastures, such as grass borders in tilled fields,

(*iii*) Insufficiency of dry fodder such as the straw of cereals or the stems and leaves of pulses,

(*iv*) Absence of green fodders in dry seasons,

(*v*) Absence of mineral constituents in fodder and feeding stuffs.

(*c*) Please mention the months of the year in which fodder shortage is most marked in your district. For how many weeks does scarcity of fodder usually exist ? After this period of scarcity ends how many weeks elapse before young growing cattle begin to thrive ?

(*d*) Can you suggest any practicable methods of improving or supplementing the fodder supply that would be applicable to your district ?

(*e*) How can landowners be induced to take a keener practical interest in these matters ?

Part IV

17. Agricultural Industries.

(*a*) Can you give any estimate of the number of days of work done by an average cultivator on his holding during the year ? What does he do in the slack season ?

(*b*) Can you suggest means for encouraging the adoption of subsidiary industries ? Can you suggest any new subsidiary industries to occupy the spare time of the family which could be established with Government aid ?

(*c*) What are the obstacles in the way of expansion of such industries as beekeeping, poultry rearing, fruit growing, sericulture, pisciculture, lac culture, rope making, basket making, etc. ?

(*d*) Do you think that Government should do more to establish industries connected with the preparation of agricultural produce for consumption, such as oil pressing, sugar making, cotton ginning, rice hulling, utilisation of wheat straw for card-board, utilisation of cotton seed for felt, fodder, oil and fuel, utilisation of rice straw for paper, etc. ?

(*e*) Could subsidiary employment be found by encouraging industrial concerns to move to rural areas ? Can you suggest methods ?

(*f*) Do you recommend a more intensive study of each rural industry in its technical, commercial and financial aspects, with a view to, among other things, introduction of improved tools and appliances ?

(*g*) Can you suggest any other measures which might lead to greater rural employment ?

(*h*) Can you suggest means whereby the people could be induced to devote their spare time to improving the health conditions of their own environment ?

8

Agricultural Labour.

(*a*) What measures, if any, should be taken to attract agricultural labour from areas in which there is a surplus to—

(*i*) areas under cultivation in which there is a shortage of such labour ? and

(*ii*) areas in which large tracts of cultivable land remain uncultivated ?

Please distinguish between suggestions designed to relieve seasonal unemployment and proposals for the permanent migration of agricultural population.

(*b*) If there is any shortage of agricultural labour in your Province, what are the causes thereof and how could they be removed ?

(*c*) Can you suggest measures designed to facilitate the occupation and development, by surplus agricultural labour, of areas not at present under cultivation ?

19. Forests.

(*a*) Do you consider that forest lands as such are at present being put to their fullest use for agricultural purposes ? For instance, are grazing facilities granted to the extent compatible with the proper preservation of forest areas ? If not, state the changes or developments in current practice which you consider advisable.

(*b*) Can you suggest means whereby the supply of firewood and fodder in rural areas may be increased ?

(*c*) Has deterioration of forests led to soil erosion ? What remedies would you suggest for erosion and damage from floods ?

(*d*) Can you indicate any methods by which supply of moisture in the soil, the rainfall and supply of canal water can be increased and regulated by afforestation or by the increased protection of forests so as to benefit agriculture ? Would the same methods be useful in preventing the destruction by erosion of agricultural land ?

(*e*) Is there an opening for schemes of afforestation in the neighbourhood of villages ?

(*f*) Are forests suffering deterioration from excessive grazing ? Is soil erosion being thereby facilitated ? Suggest remedies.

20. Marketing.

(*a*) Do you consider existing market facilities to be satisfactory ? Please specify and criticise the markets to which you refer, and make suggestions for their improvement.

(*b*) Are you satisfied with the existing system of marketing and distribution ? If not, please indicate the produce to which you refer and describe and criticise in detail the channels of marketing and distribution from the producer to the consumer in India (or exporter in the case of produce exported overseas). State the services rendered by each intermediary and whether such intermediary acts in the capacity of merchant or commission agent, and comment upon the efficiency of these services and the margins upon which such intermediaries operate. Please describe

MINUTES OF EVIDENCE

TAKEN BEFORE THE

ROYAL COMMISSION ON AGRICULTURE.

Thursday, October 14th, 1926.

SIMLA.

PRESENT:

THE MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.

Mr. H. CALVERT, C.I.E., I.C.S.
Raja SRI KRISHNA CHANDRA GAJAPATI NARAYANA DEO OF PARLAKIMEDI.
Professor N. GANGULEE.
Dr. L. K. HYDER.
Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH (*Joint Secretaries*).

Mr. W. P. SANGSTER, C.S.I., C.I.E., Chief Engineer, Irrigation Works, Punjab.

Replies to the Questionnaire.

QUESTION 4.—ADMINISTRATION.—In 1922 the appointment of Inspector General of Irrigation in India was abolished and a new post of Consulting Engineer to the Government of India created. On the departure of the last incumbent of the post, on leave preparatory to retirement, in March, 1925, the appointment has been practically in abeyance and is so still. It is understood that the Government of India have recently decided that the post of Consulting Engineer must be retained, but that the precise form or the status of the office of the Consulting Engineer to the Government of India is still under consideration. It may be that the time taken up in the consideration of this matter might become prolonged. Meanwhile the Province is losing the advantages of the advice and assistance

the method by which each transaction is effected, or in the case of barter by which an exchange is effected.

(*c*) Do you wish to suggest steps whereby the quality, purity, grading or packing of agricultural produce may be improved, distinguishing where possible between produce destined for—

(*i*) Indian markets ?

(*ii*) Export markets ?

(*d*) Do you think that more effective steps might be taken to place at the disposal of cultivators, merchants and traders information as to market conditions, whether Indian or overseas ; crop returns ; complaints as to Indian produce from wheresoever originating ; and agricultural and marketing news in general ?

21. Tariffs and Sea Freights.

Do existing (*a*) customs duties, both import and export, and (*b*) sea freights adversely affect the prosperity of the Indian cultivator ? If so, have you any recommendations to make ?

22. Co-operation.

(*a*) What steps do you think should be taken to encourage the growth of the co-operative movement—

(*i*) by Government,

(*ii*) by non-official agencies ?

(*b*) Have you any observations to make upon—

(*i*) Credit societies ;

(*ii*) Purchase societies ;

(*iii*) Societies formed for the sale of produce or stock ;

(*iv*) Societies for effecting improvements—*e.g.*, the digging of wells and the construction of bunds, walls and fences, or the planting of hedges ;

(*v*) Societies formed for the aggregation of fragmented holdings and their redistribution in plots of reasonable size ;

(*vi*) Societies for the co-operative use of agricultural machinery ;

(*vii*) Societies for joint farming ;

(*viii*) Cattle breeding societies ;

(*ix*) Societies formed for any purpose connected with agriculture or with the betterment of village life, but not specified above ?

(*c*) Where co-operative schemes for joint improvement, such as co-operative irrigation or co-operative fencing or a co-operative consolidation of holdings scheme, cannot be given effect to owing to the unwillingness of a small minority to join, do you think legislation should be introduced in order to compel such persons to join for the common benefit of all ?

(*d*) Do you consider that those societies of which you have personal knowledge have, in the main, achieved their object ?

23. General Education.

(*a*) Do you wish to make observations upon existing systems of education in their bearing upon the agricultural efficiency of the people ? If you make suggestions, please distinguish, as far as possible, between—

(*i*) Higher or collegiate,

(*ii*) Middle school, and

(*iii*) Elementary school education.

(*b*) (*i*) Can you suggest any methods whereby rural education may improve the ability and culture of agriculturists of all grades while retaining their interest in the land ?

(*ii*) What is your experience of compulsory education in rural areas ?

(*iii*) What is the explanation of the small proportion of boys in rural primary schools who pass through the fourth class ?

24. Attracting Capital.

(*a*) What steps are necessary in order to induce a larger number of men of capital and enterprise to take to agriculture ?

(*b*) What are the factors tending to discourage owners of agricultural land from carrying out improvements ?

25. Welfare of Rural Population.

(*a*) Outside the subjects enumerated above, have you any suggestions to offer for improving hygiene in rural areas and for the promotion of the general well-being and prosperity of the rural population ?

(*b*) Are you, for instance, in favour of Government conducting economic surveys in typical villages with a view to ascertaining the economic position of the cultivators ? If so, what, in your opinion, should be the scope and methods of such enquiries ?

(*c*) If you have carried out anything in the nature of such intensive enquiry, please state the broad conclusions which you reached.

26. Statistics.

(*a*) Do you wish to make suggestions for the extension or improvement of the existing methods of—

(*i*) ascertaining areas under cultivation and crops ;

(*ii*) estimating the yield of agricultural produce ;

(*iii*) enumerating livestock and implements ;

(*iv*) collecting information on land tenure, the incidence of land revenue and the size of the agricultural population ;

(*v*) arranging and publishing agricultural statistics ?

(*b*) Have you any other suggestions to make under this heading ?

of the Consulting Engineer in irrigation matters. Irrigated areas are the bright spots in India's agricultural economy. Where irrigation is possible there exist enormous possibilites of agricultural achievement. The existence of a strong central control has in the past been of the utmost value to irrigation in India as a whole. The arguments in favour of the retention of such control are irrefutable. The Consulting Engineer as liaison officer between the Central Government and the Provinces would be the means of a general dissemination of technical information and of the benefit of experience gained in one Province being placed at the disposal of others. He would be always on the spot, as it were, and available for giving advice to any Province on any difficult technical questions connected with irrigation projects. The local officers of Provinces would be able to lay their plans with full details and estimates before him with full confidence of getting useful advice and valuable opinions. The opportunity of airing his views, of asking for advice and of talking "shop" generally with the professional brother of long experience in other places and with a reputation for sound technical ability would be of inestimable benefit to the irrigation engineer of other Provinces. These advantages have been denied to them during the last eighteen months. It seems advisable, therefore that the period of abeyance of the appointment should be shortened as much as possible. A recommendation to this effect from the Agricultural Commission might help to expedite a decision in the matter.

It is understood that the Government of India have also under their consideration a proposal to establish an Irrigation Board before which all schemes submitted to the Government of India would be laid. The proposal is that all the Provinces should co-operate and that all their Chief Engineers (Irrigation) together with the Consulting Engineer to the Government of India should be regarded as members of a Central Board. Every project referred to the Government of India would be examined by a sub-committee of the Board, and it would be open to any Local Government to ask for a sub-committee to advise on difficult technical questions connected with an irrigation project under preparation.

QUESTION 8.—IRRIGATION.—(1) (*a*) Irrigation in the Punjab is fully dealt with in the Punjab Memorandum for the Royal Commission on Agriculture, pages 24 to 90. There is also a supplementary memorandum* dated 17th July, 1926, on "*Crop Irrigation Observations.*" New irrigation schemes and extensions of existing systems are dealt with in paragraphs 11 to 28, pages 29 to 59. Improvements in existing systems are discussed in paragraph 29, page 59. Tanks or reservoirs are dealt with in paragraph 26, page 50. Well irrigation is referred to in paragraph 32 (VII), page 73 and also on pages 88 and 89. A further reference to tube well irrigation is given on pages 182 and 183. "Bunds" are referred to in paragraph 33, page 74.

(*b*) The economic distribution of supply is dealt with in paragraphs 30 and 31, page 62. It is dealt with in more detail in The Punjab Irrigation Branch Papers Nos. 12, 13, 24, 26, 26A, 27. The last three are the latest and most up-to-date. Punjab Irrigation Branch Paper 26 describes the best form of outlet for distribution to cultivators at the tail end. Prevention of wastage of water by absorption in the soil is dealt with in paragraph 34 V (*c*), page 86 (waterproofing channels).

(2) The attached statement shows at a glance the new areas to be irrigated by new irrigation schemes and by extensions of existing systems. (This statement does not include possible extensions of tube well irrigation to be undertaken by the Agricultural Department or by private enterprise. On page 183, a reference is made to the great field for tube well system of

* Not reprinted.

irrigation in areas uncommanded by flow irrigation and where subsoil water level is reasonably close to the ground surface.) The statement shows that the area irrigated every year in the Punjab when the contemplated schemes have been developed will be practically double that of what it is now. It will be approximately 20 million acres. The total of the gross commanded area in the Punjab will be approximately 36 million acres. In the whole of Egypt and the Sudan the gross commanded area is only something over 8 million acres. In the Sukkur Barrage Canals Project the gross commanded area is a little over 7 million acres. It is thus realised that there is a vast field for development in the Punjab.

(3) On page 30 of the Memorandum is given a statement of the undeveloped lands in the Colony Canal areas. The total areas there shown as available for development is 641,759 acres. In addition there are 100,000 acres of inferior land on the Lower Bari Doab Canal and 65,000 acres of *charagah* land on the Lower Jhelum Canal (exclusive of the 10 per cent. *charagah*) awaiting development. The grand total is thus over 800,000 acres. If the *charagah* areas on the Lower Chenab Canal and on the Lower Jhelum Canal were reduced from 10 per cent. to 5 per cent., the additional area available for development would be approximately 200,000 acres; thus bringing the grand total up to 1,000,000 acres.

The problem as to how the development of these vast areas could be expedited requires consideration.

To a certain extent development in the Punjab is being retarded by the opposition of the Bombay Government to all new irrigation schemes in the Punjab. Two large schemes, viz., the Thal Canal and the Jalalpur Hydro-Electric Project, which were submitted to the Government of India for sanction some time ago, have been held in abeyance because of the opposition of the Bombay Government. This matter is referred to on page 41 of the Memorandum.

(4) In connection with methods employed to prevent wastage of water, it may be mentioned that the quantity of water allowed per outlet is strictly limited and there is no margin for wastage. The *standard* allowance is calculated as follows:—

Only 75 per cent. of the culturable commanded area on an outlet is supposed to be irrigated annually, and of that one-third is to be irrigated in *kharif* and two-thirds in *rabi*. At the outlet head one cusec* is allowed for every 88 acres in the *kharif* season. Allowing for 10 per cent. absorption in the distributary this requires at the distributary head one cusec for every 80 acres, and at the canal head (allowing 18 per cent. for absorption in Main Canal and Branches) one cusec for every 65 acres. Thus for every 1,000 acres of culturable commanded land on an outlet the calculation is as follows:—

	Acres.
Culturable commanded area	1,000
Area to be irrigated annually	750
Area to be irrigated in *kharif*	250

250/88=2·84 cusecs per 1,000 acres at outlet head.

(5) In the *rabi* season the channels run with full supplies for approximately half the time during which they run in *kharif* and the duty in *rabi* has therefore to be double that in *kharif*. Although for the majority of cultivators that allowance is a very small one yet the following figures show what can be done by skilful cultivation and economical use of water. On the three most highly developed canals in the Punjab the following are

* 1 cubic foot of water per second.

the *kharif* and *rabi* duties per cusec of mean discharge at canal head in the last eight years:—

	Kharif.			Rabi.		
	U.B.D.C.	L.J.C.	L.C.C.	U.B.D.C.	L.J.C.	L.C.C.
1917–18	132	91	95	280	230	220
1918–19	96	80	84	225	185	220
1919–20	122	92	95	230	200	226
1920–21	105	84	88	230	210	210
1921–22	111	100	99	223	208	211
1922–23	107	90	98	268	245	229·5
1923–24	113	107	111	242	216	241
1924–25	139	119	134	249	231	259
	8) 925	8) 763	8) 824	8) 1,947	8) 1,725	8) 1,816·5
	116	95	103	243	216	227

These actually achieved duties may be compared with the duties of 65 in *kharif* and 130 in *rabi* used in the calculation above.

(6) The actual "deltas" on the same three canals during the same eight years were as follows:—

("Delta" means depth of water in feet put on to the area irrigated.)

	Kharif.			Rabi.		
	U.B.D.C.	L.J.C.	L.C.C.	U.B.D.C.	L.J.C.	L.C.C.
1917–18	2·21	3·0	2·46	0·94	1·6	1·46
1918–19	3·17	3·7	3·34	0·93	1·8	1·46
1919–20	2·6	3·0	2·8	1·1	1·7	1·4
1920–21	2·64	3·6	3·38	1·09	1·5	1·47
1921–22	2·54	3·0	2·98	1·24	1·68	1·40
1922–23	2·66	3·67	2·9	1·02	1·31	1·3
1923–24	2·58	2·8	2·77	1·16	1·4	1·31
1924–25	2·67	3·1	2·7	1·46	1·6	1·4

(7) As regards wastage of water by evaporation and by absorption in the soil, it may be mentioned that the amount of evaporation from irrigating channels in the hot weather is less than one-tenth of the amount of absorption. In the cold weather it is very much less. When losses by absorption are referred to, the amount lost is assumed to include that lost by evaporation. It may be mentioned that from experiments made on the Ganges Canal and on the Upper Bari Doab Canal in the *rabi* season, out of every 100 cubic feet entering the head of the Canal 20 cubic feet were lost in the canal and branches, 6 cubic feet in distributaries, and 21 cubic

feet in village water-courses. This left 53 cubic feet delivered on the fields, of which it was estimated that 25 cubic feet were wasted in various ways. In order to induce the cultivators to reduce wastage in the fields, it is laid down in rule 9 of the Canal Act that compartments ("*kiaris*"), about one-eighth acre in area, must be made in all classes of fields except those for rice and gardens, and that each compartment must be irrigated by means of a small water channel in the same manner as irrigation from a well is done. When a field is irrigated which has not been so prepared, an additional charge may be imposed.

(8) Rule 7 under the Canal Act gives the Divisional Canal Officer power to withhold water where in his opinion loss from wastage is likely to occur, and (rule 17) where a water-course is not maintained in proper repair. Elaborate and long-continued experiments were made on different kinds of linings for water-courses to prevent waste by absorption, but it was found in the end that the cost of the only satisfactory lining was prohibitive. See page 87 of Memorandum. As regards incentives to economise in canal water, the duty and delta figures given above show that the best cultivators on the older canals, especially those on the Upper Bari Doab Canal, have apparently already arrived at a maximum efficiency. On the Upper Bari Doab Canal the supplies available have always been more limited than on any other canal and that has forced the cultivators to use what supplies they received as economically as possible.

(9) It has sometimes been suggested as an improvement in the existing system of irrigation in the Punjab that an increase in the capacity of our Punjab Canals would result in an enormous increase in the areas irrigated, and would especially lead to a large increase in the area under cotton. The idea would seem to be that the intensity of irrigation on Punjab Canals should be increased to about 150 per cent. of the culturable commanded area. Apart from the question that the increased supplies to obtain the higher intensities would accentuate the evils of water-logging, experience tends to show that an intensity of much over 100 per cent. is ordinarily impossible except round towns where ample manure is procurable and market gardening freely resorted to. On the whole of the Lower Chenab Canal area (a gross area of 3,390,881 acres and a culturable commanded area of 2,598,583 acres) the intensity is already 100 per cent. (see column 8 of the statement attached). As regards the Lower Jhelum Canal, it does not, as yet, make use of its full capacity in the *kharif*. As regards the other canals, the *kharif* demand depends very largely on the supplies available in April and May, and the existing capacities of the channels are ample for utilising the supplies available in those two months. No increase in the intensity of irrigation on these canals seems possible until such time as dams are constructed to conserve supplies and dole them out to supplement shortages at critical periods. This matter has been fully dealt with in a Punjab Irrigation Branch Paper No. 27 (on page 7 in the note, dated 21st May, 1923, on the proposal to increase capacities of the Punjab Canals to take advantage of surplus supplies in the rivers during the *kharif* season). On page 90 of the Memorandum it is shown that the intensity might be increased by 20 per cent. in some areas if the cultivators would exercise due economy in the use of water (see also the Punjab Irrigation Branch Paper No. 11).

Mr. W. P. Sangster.

Areas irrigated by existing canals in the Punjab.

Canal.	Gross area commanded.	Culturable commanded area.	Area proposed to be irrigated annually.	Actual annual irrigation in 1924-25.	Maximum area irrigated in any one year.	Year in which maximum area was irrigated.	Percentage of culturable commanded areas irrigated.
1.	2.	3.	4.	5.	6.	7.	8.
Lower Chenab	3,390,881	2,598,583	1,740,379	2,466,385	2,560,932	1921-22	100
Lower Jhelum	1,337,905	1,244,264	823,149	845,506	880,328	1922-23	66
Lower Bari Doab Canal	1,748,752	1,505,343	979,672	1,159,000	1,159,745	1924-25	80
Upper Bari Doab Canal	1,639,499	1,504,059	1,083,760	1,194,606	1,343,471	1921-22	86
Sirhind Canal	2,445,945	2,088,529	795,507	1,008,834	1,616,341	1921-22	70 to 57
Western Jumna	2,734,024	2,304,887	898,592	741,914	875,841	1914-15	32 to 38
Upper Chenab Canal	1,577,010	1,499,092	656,619	536,712	661,900	1922-23	35 to 44
Upper Jhelum Canal	603,740	572,685	312,688	304,723	358,567	1921-22	53 to 63
TOTAL	15,477,756	13,317,442	7,290,366	8,257,680	9,457,125	—	—
Upper Sutlej Inundation	989,730	899,836	329,184	365,695	439,679	1914-15	43 to 49
Sidhnai	419,848	395,629	259,648	324,069	331,659	1914-15	82 to 84
Indus Inundation	704,455	649,286	292,178	243,322	310,605	1910-11	38 to 48
Shahpur Inundation Canals	127,995	116,209	66,170	75,456	85,971	1900-01	64 to 74
Ghaggar Canal	131,228	107,596	64,143	42,836	48,711	1912-13	40 to 45
Lower Sutlej	799,907	739,125	301,210	384,346	374,059	1914-15	52
Chenab Inundation Canals	419,040	388,023	209,520	200,517	219,398	1914-15	52 to 60
Muzaffargarh Inundation Canals... ...	728,389	647,317	394,517	298,405	385,365	1912-13	46 to 59
TOTAL	4,320,592	—	1,916,570	1,934,646	2,195,447		
GRAND TOTAL	19,798,348	—	9,206,936	10,192,326	11,652,572		

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Areas to be irrigated by projected canals in the Punjab and by extensions.

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1.	2.	3.	4.	—
Sutlej Valley Project (New areas)	5,000,000	4,807,313	3,600,329	*N.B.*—If we add total of column 6 to total of bottom half of column 4 we get 11,652,572 + 9,246,055 = 20,898,627 acres. Say 21 million acres.
Pir Mahal Extension	38,443	36,000	24,000	
Khikhi Extension	20,525	17,738	12,605	
Burala Branch Extension	173,251	160,000	88,750	
Gajargola Disty. Extension	11,000	6,025	2,410	
8-R Disty. Extension	31,615	31,615	21,000	
9-R Disty. Extension	17,000	17,000	11,000	
Plot J. L. B. D. C.	15,000	14,000	11,000	
Thal Canal	4,599,739	2,596,632	2,170,000	
Haveli Project	1,161,164	1,161,164	714,266	
Bhakra Dar Project (New area)	4,667,047	4,600,000	2,450,000	
Jassowal Disty. Extensions	60,000	55,000	40,000	
Jalalpur Hydro-Electric Project	167,824	134,258	100,695	
TOTAL	15,962,608	13,636,745	9,246,055	
GRAND TOTALS	35,760,956 (say 36 millions)		18,452,991 (say 18½ millions to 21 millions).	
Sukkur Barrage Canals	7,494,000	6,530,000	5,308,000	
Egypt and the Sudan	8,100,000	—	—	

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QUESTION 9.—SOILS.—(1) The improvement of soils by drainage and other means and the reclamation of "alkali" land is dealt with in paragraph 32, page 68 onwards of the Memorandum. This paragraph shows that the Irrigation Department of the Punjab has appointed a Scientific Research Officer for conducting research work on problems connected with irrigation, *e.g.*, movements of the water-table, variability of the subsoil, silt transport, water-logging, drainage, hydrodynamical problems (page 71), lining of channels, etc.

Some measures, *e.g.*, bunds for the prevention of the erosion of the surface soil by flood water are mentioned in paragraph 33, page 74, onwards.

(2) The subject of water-logging of the soil is very fully dealt with in the Punjab Irrigation Branch Paper No. 20 and its supplements. These papers contain very valuable information regarding the general principles that have up to date been evolved and the methods adopted for the prevention of water-logging and for the treatment of water-logged area. In the Supplement to Punjab Irrigation Branch Paper No. 20 the information is brought still further up to date. Attached to this supplement are diagrams showing the rise and fall of the spring level in the Hafizabad tract on the Lower Chenab Canal from the year 1902-22. The rainfall for each year has also been shown on these diagrams. A study of these diagrams shows that although the spring level is high yet it has not been getting worse. During the 10 years or so, previous to 1922, the water-table was more or less stationary and during the last few years prior to 1922 there was a general improvement. Exactly the same conclusions can be drawn from the diagram of the tract near Amritsar. The spring level here, too, has been more or less stationary since 1895, *i.e.*, at about 10 feet or 11 feet below natural surface. All diagrams show that the effect of rainfall on the spring level is very marked. They also show that the water-table has reached a state of equilibrium, *i.e.*, under normal conditions the inflow (percolation from canal channels, absorption from irrigation, and rainfall) is balanced by the subsoil outflow and it is only in a year of abnormal rainfall when the natural and artificial surface drainages cannot deal with the downpour and flooding occurs that this balance is upset and there is a temporary rise of spring level.

(3) A note on the *kallar* condition of soils by Dr. P. E. Lander, Agricultural Chemist to the Punjab Government, is given on page 35 of the Supplement to the Punjab Irrigation Branch Paper No. 20.

(4) In Appendix V of the Punjab Irrigation Branch Paper No. 20 is given a synopsis of work done in water-proofing canals and the 2nd Supplement contains a statement showing details and conditions of all the linings. These papers are mentioned merely to supplement the information already given on page 86 of the Memorandum.

(5) Another measure which is being adopted in order to minimise water-logging by reducing the seepage through canal banks is to lower the bed of main canals by cutting down the sills of falls. The channels which are thus left uncommanded by the lowering of the main canal are to be fed by means of hydrautomats, hydropulsors, ejectors, or by Sir Ganga Ram's patent hydraulic lift irrigator. The question as to which of these patent automatic lift machines should be adopted is still under consideration. Probably each will be given a trial as there are many canal falls where they could be utilised. They can also be used as automatic pumps for draining water-logged areas.

(6) There is a large area (about 100,000 acres) of what is called "bara" soil on the Lower Bari Doab Canal, and about two years ago the Punjab Department of Agriculture devised a scheme of operations for the reclamation of the *bara* land, and the scheme has now been put into operation. The first method advocated was based on the principle of washing the salts from

the soil into the subsoil. The first efforts were not very successful owing to the peculiar conditions of the soil, but the experiments are being repeated. Of all the methods of reclamation yet tried applications of sand, five or six inches deep, have given the best result. This method, however, is not universally applicable as the quantity of sand available is very limited, unless it can be transported from great distances, which is out of the question. *Bara* soils treated with powdered gypsum slowly become amenable to cultivation. The expense of this method, however, is beyond ordinary cultivators. Ordinary cultivation *versus* deep cultivation by means of steam tackle have been tried. Results are in favour of deep cultivation. Afforestation as a means of reclamation is also being tried. The Forest Department is advising and assisting the Agricultural Department in this.

(7) *Bara* soils and inferior lands on the Lower Bari Doab Canal are also being granted to certain persons of the peasant class on certain favourable conditions in order that they might become the means of reclaiming these tracts. One of the conditions for the grant of an area of inferior land is that after a certain number of years, if the land has been brought up to a certain standard of productivity, the tenant may become proprietor of *half* the area reclaimed on certain favourable terms. If a tenant succeeds in reclaiming *bara* land he may, on certain favourable terms, after a certain number of years, become the proprietor of the whole area reclaimed.

QUESTION 10.—FERTILISERS.—One method employed in the Punjab to discourage the practice of using cow-dung as fuel is mentioned on page 186 of the Memorandum. Large canal areas have been taken up for irrigated forest plantations to provide sources of wood supply for fuel so that the people may be induced to take to burning firewood instead of cattle-dung.

In addition to these irrigated plantations which are managed by the Forest Department, there are large areas of canal plantations and many hundreds of miles of canal avenues along all the irrigation channels managed by the Canal Department. The total receipts from the Canal Department plantations in the Punjab during 1924-25 amounted to Rs.1,15,431. It has recently been decided to ask for the services of a Forest Officer from the Forest Department to inspect the Canal Department plantations and advise on the best methods of afforestation.

QUESTION 16.—ANIMAL HUSBANDRY.—As regards (*d*), *viz.*, practical methods of supplementing fodder supplies, it may be mentioned that, wherever feasible, canal banks are always let out for grazing and judging by the demand for grazing leases on canal banks, it may be concluded that this method of providing fodder supplies for village cattle is keenly appreciated. The grazing leases on canal banks in the Punjab produce an annual income of approximately Rs.40,000. The length of channels in operation at the end of March, 1925, was 19,814 miles, *viz.*, 4,314 miles of main canals and branch canals, and 15,500 miles of distributaries.

QUESTION 18.—AGRICULTURAL LABOUR.—The measures taken in the Punjab to attract agricultural labour from areas in which there was a surplus to areas in which large tracts of culturable land remained uncultivated were to give grants of land to settlers from congested districts. All Government waste lands which became fit for cultivation by the introduction of canal irrigation were brought under a scheme of colonisation. The grants took various forms; some whole villages were let out to capitalists on payment, others were granted to persons who deserved well of Government; more usually, however, separate plots in each village were granted and the grantees were required to take up residence and build houses on a site set apart for the purpose. In the first instance grantees after a period of probation were usually given rights of occupancy tenants holding under Government, various conditions being attached to the tenancies, *e.g.*, the

conditions of permanent residence, and of cultivating the land allotted. Other conditions in some cases were the keeping of brood-mares for horse-breeding, the breeding of camels, of mules, and of cattle, the introduction of scientific methods of agriculture, the cultivation of superior varieties of particular crops, the maintenance of nurseries, or planting trees, the production of improved seeds, etc. In all villages a certain area remained unallotted and was retained by Government to be utilised as grazing grounds, or for some other common purposes. Some recent grants made for cattle-breeding are mentioned on page 265 of the Memorandum. Also grants have been made in recent years to certain persons of the peasant class on the Lower Bari Doab Canal on the condition, among others, that they brought a certain area of *bara* and inferior lands up to a certain standard of productivity. Grants have also been made to criminal tribes. (Statements of conditions applicable to all classes of tenants are given in Chapter VII of Volume II of the Punjab Colony Manual.)

QUESTION 19.—FORESTS.—The problem of the supply of firewood in rural areas has been solved by instituting irrigated plantations in the canal areas. These irrigated plantations have already been mentioned in answer to Question 10—Fertilisers—and are further referred to on page 186 of the Memorandum.

QUESTION 26.—STATISTICS.—The methods of ascertaining areas under cultivation and crops are referred to in paragraph 31, page 63, onwards of the Memorandum. There was a retrenchment proposal in 1922 to revive the idea of amalgamating canal and revenue *patwaris*. This question first arose in 1910 and was fully considered during the following years until 1919 by a large number of revenue and irrigation officers of rank and experience. During that period several conferences were held, and during 1917 and 1918 practical experiments of such amalgamation were made over considerable areas on the Jhelum and Chenab Canals.

There was an idea that unification would be feasible and result in (1) removal of duplication of work, (2) reduction of establishment and expense, (3) reduction of the number of petty officials who are said to prey upon irrigators.

As regards (1) the experiments showed conclusively that the work performed by both kinds of *patwaris* could not be performed by one official. The two duties are quite different and performed with entirely different objects. In the one case distribution of canal water has to be measured and recorded; this duty must be done promptly and rapidly; the official in charge of it has to be continually on the spot and on the alert; his time is fully occupied. In the other case, that of the revenue *patwari*, the whole idea is the correct maintenance of the land records which have been built up during the past fifty years for the primary purposes of assessment of land revenue and for the recording of rights of landlords and tenants. The official who is occupied in this complicated work could not possibly devote time to the measurement of distribution of water. The only way in which the duties may seem to overlap is in crop inspections; but these are, and must be, different for the canal and revenue *patwaris*. The whole object of the irrigation inspection is to discover the amount of water supplied and the amount of rate recoverable and amount of rate which may be remitted on account of short supply; that of the revenue inspection on the other hand relates to the various kinds of crops sown and harvested, their condition, reasons for failure, questions regarding tenure and cultivation and other matters all required for the purposes of settlement, decision of rent and revenue suits and other matters connected with the welfare of the agriculturists.

It is therefore a fallacy to believe that there is duplication of work.

As for (2) the experiments showed that the time of both *patwaris* is fully occupied and that, even if such unification were possible, the number of

officials could only be reduced to a small extent. It was however found that supervision by (*a*) the Canal or Revenue Department alone, or (*b*) both jointly is out of the question, for it creates endless difficulties and friction.

Regarding (3), even if the number of petty officials were reduced this would make no difference in the amount extorted but would merely mean an increase in illicit income to the individuals. The proper way to deal with this matter is to induce the people to combine in a correct manner against such extortion and to punish severely those who are found guilty. It is in fact a matter which the people themselves must take in hand. A mere reduction of officials has nothing whatever to do with it.

Finally, both the Financial Commissioners and the Chief Engineers and the Lieut.-Governor decided that the proposal must be definitely abandoned as impracticable.

Later a resolution was passed in the Punjab Legislative Council that a new experiment of amalgamating canal and revenue *patwaris* should be tried in the Western Jumna canal area. This experiment is still in progress.

Oral Evidence.

40,112. *The Chairman*: Mr. Sangster, you are Chief Engineer of Irrigation Works, Punjab?—Yes.

40,113. We have been lucky enough to find you in these parts and so we have asked you to come before us. The Commission has read your very interesting note which, when read in conjunction with the other memorandum provided for the Commission by the Punjab officers, gives, I think, a very complete picture of the particular questions with which memorandum deals. I should like to ask you and some officers in the Punjab some more detailed questions when we come to your province on our inquiry. But there are one or two general points which I should like to ask and also one or two points of detail. I see that you are strongly of opinion that the existence of a strong central control has in the past been of the utmost value to irrigation in India?—Yes.

40,114. Then I notice on page 2 the following statement: "It is understood that the Government of India have also under their consideration a proposal to establish an Irrigation Board before which all schemes submitted to the Government of India would be laid." Then you go on to discuss the proposal in a little more detail. You do not say whether you approve of that proposal?—Yes, I approve of it. In fact, the Local Government has already approved of it.

40,115. Your own view is that it is very necessary?—Yes. May I explain an instance. Some of our schemes which are awaiting sanction are hung up because apparently there is no one with the Government of India to give technical advice at present. We have got several big schemes in the Punjab awaiting sanction. We cannot get sanction apparently until something like an Irrigation Board is established.

40,116. You are feeling the lack of somebody capable of adjusting the differences between province and province?—Quite so.

40,117. Now, just one or two points in connection with your note of evidence. I think the Commission would like to hear anything that you may care to say amplifying the views set down in the two documents upon the question of the advantages of the volumetric as against the acreage method of charge for water. Do you yourself fully endorse the views set out in the Punjab Memorandum?—Those are my own personal views practically as put in in this memorandum. They are not, perhaps, the views of the Local Government but they are my own views practically.

40,118. Do you know personally any intelligent landlords or cultivators who would prefer the volumetric system of charge?—We have already several big landlords and estate managers who are taking water now on a volumetric system. Our Minister for Agriculture in the Punjab is taking it on a volumetric system in his estate from one of the canals. There are several other large landowners on the same canal who are taking water on that system.

40,119. As you are aware, irrigation charges are outside our terms of reference, but I should like to know what is your view as to the relative economic advantage from the users' point of view. Is it possible for the cultivator to get more value for his money under the volumetric system?—In some cases it is, but in the majority of cases, where we have small farmers in the Punjab, it is not to their advantage to take canal water on the volumetric system, because, as I have explained in the memorandum, the small farmer is only a small shareholder on a water-course and he would be dominated by the large shareholders and would not probably get his own share. But on the acreage system, it is part of the canal officers' business to see that every shareholder gets his share. We have nothing to do with shares under the volumetric system.

40,120. A small cultivator in an irrigated area who is getting his water on the acreage basis has to take his water when he can get it, has he not?—On the acreage system there is a cut-and-dried time-table according to which he gets his share.

40,121. If he wants to have water at all he has to have it on that time-table?—Yes.

40,122. On the volumetric system, a large landholder can turn the water on when he wishes and can turn it off when he so wishes?—Quite so; he has entire control of all the water in the water-course. It generally happens that he has tenants all over the water-course and he has to have some kind of time-table for the various tenants.

40,123. It is possible that the tenants in their turn may have to take their water at a time when it suits the landlord to have it?—Yes, if a landowner, for instance, is cultivating a certain portion of the land on the water-course himself, he might at times desire to take water for his own fields at the expense of his tenants.

40,124. Then, if you can conceive of a commanded area cultivated by a number of farmers each one of them having holdings of not less than 150 to 200 acres, such a district would present no difficulties for the volumetric system, would it? It is the smallness of the holdings that gives the preponderating advantage to the acreage system, is not it?—Practically yes. Any landholder who has enough of land to comprise one water-course, that is one outlet, can have the volumetric system quite well, only he would have to be responsible for the distribution of the water among his own labourers.

40,125. *Sir Ganga Ram*: I like the volumetric system and I wanted it for my own estate. When I asked Mr. Sangster to give me 2·5 cusecs he said he could not. Will you kindly put that question to the witness?

The Chairman: I am afraid I do not know the circumstances. I do not wish to tread on ground with which I am not familiar.

40,126. Do you think that the possibility of conserving water for the lower levels of a commanded area by irrigating the higher levels of such commanded area and constructing a tube well, offers important possibilities in some districts?—Wherever you can irrigate land by flow, it is the most economical way of doing it. You would only think of irrigating by wells where you could not get canal water to flow on to it.

40,127. Are there no cases in which if you had more water at the lower levels you could command a larger area?—Not in the Punjab.

That of course meets my point at once.

40,128. Have you come on the technical side to the ideal tube well and strainer? Have you got the ideal apparatus?—Not yet, they are still being experimented on. The great trouble is that the spaces get choked up and we have not solved that problem yet. We are still working at it. The latest strainer that has been developed by one of our workshop superintendents is one which can be mechanically cleaned while it is down in the ground but that is only in an experimental stage. If it proves to be a success, it will be a great advance.

40,129. Then one of the difficulties is the blocking of the interstices in the strainer?—Yes.

40,130. Is one of the difficulties in tube well engineering the fact that the sand in the water-bearing strata comes through the strainer into the tube and finally leaves a cavity into which the upper strata collapse?—The difficulty really is not that the sand gets in through the interstices of the strainer but that the interstices get blocked up by some chemical formation.

40,131. *Dr. Hyder*: Is it calcium carbonate?—A sort of lime formation which closes up the space and the amount of water delivered by the tube will gradually diminish.

40,132. The main purpose of the tube and strainer is to meet the difficulty I have described, and it has overcome it?—It does keep out the sand.

40,133. In your long experience do you feel yourself that the liaison between the Agricultural Department, the Forest Department and your own department is sufficient?—Yes, quite; we co-operate wherever possible. There has never been any difficulty at all. One recent development, for instance, is that the Agricultural Department have come to us for several of our engineering staff. They cannot go to the open market for them; they have to come to us because we alone have experienced men. In the same way with the Forest Department, we have a good many dealings with them over their irrigated plantations.

40,134. So that it is true to say that there is sympathetic inter-action between the departments?—Certainly.

40,135. Is that inter-action do you think as elastic in all directions as it might be? However much goodwill there may be, do you think the practice is sufficiently elastic?—I think so; I have never heard of any suggestions as to any improvement that can be made in the relations between the departments.

40,136. Do you as a department frequently receive representations from the Agricultural Department bringing forward points of difficulty which cultivators have met with?—Yes, we frequently get communications from them and we always try our best to help them as much as possible.

40,137. So that you can confidently say that you do not think there is any ground for the charge which is sometimes levelled that the Irrigation Department is concerned more with the sale of water than with the advancement of the prosperity of the agriculturists?—No, I do not think there is any ground for any charge of that kind. I do not think the Agricultural Department would complain of any want of co-operation at all.

40,138. In this new and most important area which you are about to irrigate in the Punjab, as regards a great part of it there is no population at present on the land at all, is there?—You refer, I suppose, to what is called the Nilibar, the next area which is going to be colonised; at present it is practically a bare desert with practically no population.

40,139. Do you know whether there has been any proposal that as tenants come in to occupy and cultivate this land which is going to be culturable for the first time, those tenants should be bound in the matter for instance of rotation of crops, the planting of certain varieties and manuring—in fact the rules of husbandry that we are accustomed to in Great Britain?—No; I

think as far as I know none of the new leases will have any conditions of that kind.

40,140. I am asking for information: do you think that such leases might well have restrictions of that sort?—In a certain area it would be quite feasible; it probably would not be feasible to have it over the greater part of the area because it might mean a restriction or a decrease of the price fetched for the land and we depend on the price that the land fetches to a certain extent to finance our schemes; if you imposed any strict conditions of that kind you would get a lower price probably.

40,141. Are you confident on that point?—I should think it would probably have that effect in certain areas. There is a large canal in the Punjab, the Lower Bari Doab Canal, which has a large area of inferior soil; leases are given there on very generous terms to any one who will come and take up blocks of this inferior soil and reclaim it. In fact on the worst soil if a man reclaims it he gets proprietary rights over it; and on land which is not quite so bad he can get proprietary rights on half the area he reclaims. Of course that is land for which we would not in any case, as it stands at present, get a very high price in the open market.

40,142. But on my original point: you are of course perfectly familiar with the fact that in order to obtain value for quality it is necessary to market a certain volume together. It is very difficult to obtain value for quality if you are selling a small amount of produce at a time, is it not?—Yes; you mean that the tenant would have to observe a certain rotation of crops or grow certain crops?

40,143. If you imagine yourself to be a prospective tenant on such land determined to grow the best cotton or the best wheat, would not that land attract you more by reason of the fact that your neighbours were bound to grow the best varieties rather than that they should be allowed to grow the poorer varieties and leave you with only the produce of your own farm of the higher quality?—Yes, undoubtedly; it is one of the troubles, that the cultivators do not at present go in for the best kind of crops or the most favourable crops.

40,144. Have I not succeeded at all in shaking your conviction that reasonable restrictions in leases would not reduce the attraction to prospective tenants?—Yes; I admit you have shaken my opinion; but I do not think it would be quite so easy to convince the intending purchaser.

40,145. *Mr. Kamat*: You have suggested that irrigation should remain a centralised subject with the Government of India?—Only to a certain extent; it should only be to the extent that there should be a liaison officer who would be able to go round all the Provinces and help towards co-operation.

40,146. Except for that you would be agreeable if irrigation were a Transferred subject in the Provinces, as it is so closely allied to agriculture?—It is practically Transferred at the present time, is it not?

40,147. It is at present a Central subject?—Irrigation? Not in the Punjab: it is Transferred to Local Governments; but with Local Governments it is a reserved subject.

40,148. I beg your pardon: it is a reserved subject. Would you make it a Transferred subject, that is what I am asking?—No, I think not. I think it should remain reserved in the Local Governments: especially in a province like the Punjab where there is so much at stake. Irrigation is such a tremendous thing in the Punjab that the Punjab Government would have to keep it reserved, I think.

40,149. Bearing in mind that agriculture depends a great deal on irrigation, both irrigation schemes and distribution of water, what objections have you in view if irrigation were also a Transferred subject in the hands of a Minister for Agriculture instead of a Reserved subject? What difficulties do you apprehend?—The greatest difficulty would be the engineering

staff: if it is Reserved in the Local Government, as at present, it is an all-India service: if it were Transferred to the Local Governments it would be a provincialised service and you would not get good enough men, in my opinion, to run such an enormous proposition as irrigation in the Punjab.

40,150. So it is purely from the point of view of the service that you see difficulty; can you not counterbalance that difficulty by the convenience of the agricultural population?—I do not admit that there is any inconvenience to them under the present system.

40,151. Is there a fairly good amount of co-operation between the Irrigation Officers and the Agricultural Officers so far as the distribution of water is concerned?—Absolutely entire co-operation; I think there are no hitches of any kind whatever.

40,152. With regard to this acreage system of distribution of water, have you tried co-operative methods whereby the irrigators get their own water by co-operation between themselves?—No, we have not; we have offered it to people to take it on those terms; but none of them have ever come forward; for instance the volumetric system is practically that; the shareholders would have to co-operate together and come and ask for a volumetric supply. In no case have we refused it.

40,153. The volumetric system is of recent introduction, is it not?—Yes; it is only possible to introduce it because of the introduction of our latest kind of module; what we call the adjustable proportional module.

40,154. Before that, you offered to distribute water to villages on the co-operative system if they chose to have it but they refused?—Quite so; we could never persuade any group of villagers or any group of men to take it up.

40,155. Is this volumetric system popular?—No, it is not; it is still open to offers but no one comes.

40,156. So it is unpopular; is it very costly to introduce the meters?—No; we are introducing them in any case as a matter of demonstration.

40,157. It does not involve any high initial cost?—No extra cost.

40,158. *Mr. Calvert*: With reference to the question just asked by my colleague, is it not true that you have expressed your willingness to supply water on the volumetric system to any co-operative society formed for that purpose?—Yes.

40,159. And the difficulty was that in a co-operative system membership is voluntary, whereas, having got your outlet, the taking of water from that outlet is practically compulsory; that is to say, if there are 29 irrigators to an outlet all those 29 irrigators would have to become members of the co-operative society or you must abandon the idea?—All the irrigators of that outlet must belong to the society. You could not have some not belonging to the society.

40,160. Now, just to give us some idea for comparison with other systems of irrigation, can you give a rough figure for the capital cost of irrigation works per acre irrigated?—No, I am afraid I cannot give that; I could send you the figures later.

The Chairman: Would you like that sent, Mr. Calvert?

40,161. *Mr. Calvert*: Perhaps he might take my figures, Sir. Is it correct or not that it is Rs.22·8 per acre irrigated? Is it roughly correct?—That is the capital cost?

40,162. That is your capital outlay divided by the area irrigated, 25·8 crores capital outlay divided by the area irrigated 10·78 million acres?—That is probably quite correct; it is only a case of working out the figures.

Sir Thomas Middleton: Is that for the Punjab?

40,163. *Mr. Calvert*: Yes. And your establishment charges work out about Rs.2·77 per acre irrigated?—That is the entire cost of maintenance and repairs, as we call it, per acre. It is much less than that on some canals; it is only about Re. 1-8 per acre; of course there are the interest charges to be added; and that might bring it to Rs.2-8 per acre perhaps.

40,164. And your water-rates work out to Rs.3-7 per acre?—Yes, probably a little more now since we raised the water-rates.

40,165. *The Chairman*: Would you like to send those figure in?—Yes; I will have them worked out again just to corroborate your figures perhaps.

40,166. *Mr. Calvert*: You have recently in the Punjab started a research section?—Yes.

40,167. The United Provinces propose to have what they call a research division with an Irrigation Research Officer. Would not that be dealing with very similar problems?—Probably exactly the same problems.

40,168. So you would feel inclined to suggest that this should be an Imperial question?—Yes; it should be Imperial; there should be a Central department for research as well as a Provincial department; we must still have our provincial research department, I think; but there should in addition be some Central department which would help to co-ordinate all the work which the different provinces are doing. But I think we should still have our Provincial department separate, because we probably have a few problems which are peculiar to the Punjab. Other Provinces would probably have a few problems which are peculiar to their own province, so that there must be separate Provincial departments for research. At the same time, I think there should be a Central controlling authority of some kind.

40,169. *Mr. Calvert*: Now, there is some misunderstanding in some of the provincial memoranda about the *kiari* system in the Punjab. Could you explain to the Royal Commission exactly what your *kiari* system is? You say there is a rule whereby a cultivator must arrange his field in a rectangle, otherwise you do not give him water?—Yes; but I think that is not the exact wording. There is nothing about a rectangle in the rule. It can be any shape but the area is restricted. In fact, the Northern India Canal Act lays down that a field must be properly prepared. That is all it says. In the rule under the Act, it says it must be divided into compartments not greater than a certain area and that each compartment must be fed from a central channel. That is all it says. It does not say anything about the shape of the areas, but it restricts the areas of the compartments. And another proviso is that there must be a channel feeding each compartment, meaning that you cannot fill one compartment from another compartment. But we have not been enforcing this rule much in recent years. We prefer now not to enforce that rule very strictly. In fact, we seldom do enforce it. The object of that rule was to get the people to economise in water. We have preferred in recent years to adopt other methods of making them economise, such as for instance, by instituting the latest kind of outlet and the latest kind of meters on our distributary channels and by that means we can ensure a more accurate supply of each outlet. If we are sure that no outlet is getting more than its designed supply, we do not need to worry about what they are doing with the water. The supply that we allow is so limited that really they are forced themselves to exercise as much economy as possible.

40,170. That is to say that when the question of waste of water comes up, the outlet with a fixed discharge is a better implement than the compulsory *kiari* system?—Yes. For instance, if you saw a lot of waste of water going on in any particular area, you would at once go and examine the outlet and take a discharge and see whether it was discharging its designed supply or not. If it was discharging more than its designed supply you would say, "That is the reason; he has got too much water and he is wasting it." But

it was not discharging more than its designed supply, you would leave it lone.

There must be something wrong with the mentality of the cultivator, and ou would not interfere with it?—We think this is the better way, namely, o aim at accuracies of discharge.

40,171. In the Madras memorandum, it says: "In the Punjab a system f *kiaris* is adopted. Under this every ryot must parcel out his holding nto rectangular plots whose dimensions are dependent on the discharge rom the pipe or sluice." That is not quite correct?—It is if you go by the ctual letter of the rule under the Canal Act. But we do not enforce it. There is a penalty attached, but we never enforce that penalty chiefly because it leads to corruption. It is a temptation towards corruption among the lower-paid staff. That is really why we do not enforce it very strictly.

40,172. Now, a very different question: I understand that later on in our inquiry we shall have put before us this question of elevators, and the success of the elevator will depend to some extent upon the increased outturn of such crops as wheat. I gather that on your old established canals there is no increase in the acreage under irrigated wheat?—No, in fact, there has been a decrease recently because of the increase of cotton. Cotton is becoming more popular and more cotton is being cultivated, apparently at the expense of wheat.

40,173. Then on the new canals do you anticipate a larger acreage under irrigated wheat?—I think the proportion will probably be much the same as it is on other canals. In the new areas it will be much the same as in the other canals and, as I say, there is a tendency now to decrease wheat and increase cotton. There will probably be the same tendency on the new canals, but it all depends on what the price of cotton is going to be and the price of wheat. The areas vary according to the price we find.

40,174. I hope you will stop me, if you think this question is not quite right, as regards this trouble with the Bombay Government, is it entirely due to the fact that the Bombay Government will not accept the results of observations of discharges put forward by the Punjab engineers?—Presumably that must be the explanation. We in the Punjab do not know what the explanation is. All we know is that, when we apply to the Government of India to send a reminder, all they reply is that they cannot get a reply out of the Bombay Government on this question. The Bombay Government apparently have not yet committed themselves to any reply.

40,175. You have had regular discharges taken of all the Punjab rivers?—Yes.

40,176. And in the opinion of the Punjab engineers there is an ample supply for both the Punjab and Bombay?—Ample. I have got diagrams here to prove it.

40,177. *Sir Henry Lawrence*: In regard to this volumetric system, I understand that it has only been introduced quite recently. Could you tell us when it was introduced?—About five or six years ago, I think.

40.178. And how many acres roughly are cultivated on any outlet on which you have introduced this module?—The average is about 700 acres. That is the average acreage for which we give one outlet, some are smaller, some are bigger. Some might be as big as 1,500 acres and some as small as 400 acres. But the average, the ideal size that we try to design for, is 700 or 800 acres for each outlet.

40,179. What would be the smallest area on which it would be possible to introduce such a module?—We would not like to do it on anything less than about 800 acres.

40,180. That means that a considerable number of cultivators must be on that particular outlet?—Yes.

40,181. You very seldom find 800 acres in the hands of one man?—They are nearly all small holders, so that you might have twenty or thirty shareholders even on an 800 acre outlet.

40,182. And once the water passes that module, you are not further concerned with its distribution?—No, except that when the shareholders apply to us we make out a time-table for them according to the area of each shareholder. They are supposed to make the time-table themselves, but if they cannot agree among themselves they are allowed to come to us and it is our duty to make a time-table for them.

40,183. And is there any person or body with authority to enforce that distribution?—Oh, yes. They can make a case in court if anyone breaks through that time-table.

40,184. But is there a panchayat or one of your officers who is authorised to see to it?—Well, up till recently, all canal officers had magisterial powers and could try these cases themselves. Unfortunately (in our opinion) these magisterial powers have been taken away from canal officers and the cases have to go to the local magistrates.

40,185. So it is only by recourse to the criminal court that this fair distribution can be enforced?—Yes.

40,186. And that, I take it, is not very popular?—Going to court about it is not popular. It has become much less popular now since the magisterial powers of canal officers have been taken away. Formerly it was quite convenient for a man to go to the nearest canal officer and get his case tried in a summary manner. Now he cannot get that done. He has to go to the headquarters, probably, of the district. He may have to wait for weeks, and months perhaps, before his case can come on.

40,187. Do I understand you to say that this module was only introduced on the application of a body of cultivators?—No, we are gradually introducing it all over, in any case, as a matter of administration.

40,188. And entirely at your discretion?—We would do it all immediately if it were feasible. But financially it is not feasible to do it all at once. We have to do it gradually. And then you cannot do it in the middle of the crop. You have to wait probably till the end of the crop to make any change.

40,189. Does it cost some money to install it?—Only about Rs.150 or so for each outlet.

40,190. Is it liable to manipulation?—That is the great point about the latest module which we have introduced. It has beaten all other modules in that respect, in that it cannot be interfered with by the zamindar. That is one of the greatest points about it.

40,191. They cannot pull out a brick here and make a little cut underneath or resort to any of the favourite devices of landholders to get more water?—It is not, in the first place, easy to interfere with it. It would have to be some very elaborate alteration which would be at once noticeable. It cannot be done surreptitiously.

Mr. Calvert: The proof of deliberate interference would be perfect.

40,192. *Sir Henry Lawrence*: It would be very difficult to find out who has done it?—We would fine the whole village.

40,193. I am much interested in this, because I was told by the Sind engineers that they could not find a module that would be proof against fraud. What is the name of your module?—We call it A.P.M., *i.e.*, Adjustable Proportional Module, and one of the pamphlets which I have handed to the Secretary of the Commission describes that module. No. 26, I think it is, and 26A.

40,194. *Sir Ganga Ram*: You reduced the water lately all round on the basis that people should not get more than 75 per cent. Is that right?—75 per cent. is the basis on which we now give the water.

40,195. That gives the delta during the *kharif* of 36″ and in the *rabi* 12″, is that right?—Yes.

40,196. You do not go beyond the formula allowed, and that is why this is not favoured by the large landholders. There is no elasticity about it?—We cannot give more than that allowance

40,197. That is the reason why it is unpopular? I mean to say, there are advantages in the other system, while there is no elasticity in this. It will become too rigid?—There is not enough water to go round as it is.

40,198. Do you think this is the best form of outlet to protect the rights of people at the tail end?—That is one of the great advantages of this new outlet.

40,199. Do you know whether in the other provinces they have got a similar outlet?—No, I cannot say.

40,200. That is exactly the reason why there should be some central control over the design of outlets. Do not you think so?—I quite agree that it is one of the reasons why there should be a strong central control of some kind.

40,201. In distributing water, or at least in designing the quantity of water, how much do you allow for the distance or the land from the outlet; how much, that is, do you allow for absorption?—We do not make any allowance at all. All we are concerned with is the amount at the outlet itself.

40,202. Suppose the land is about three miles away from the outlet. Will you not give a little water for absorption?—No, because we design all our systems in such a manner that no water-course is more than three miles long from the outlet to the furthest field.

40,203. In that case, the man whose land is just near the outlet would be at an advantage as compared with the man whose land is further away?—No, because he gets a shorter time than the others.

40,204. That is only in the case of small landholders, but supposing one has an area of 800 acres about three miles away, what would you do?—We do not make any difference on that account.

40,205. You have a regular time-table showing the delta required for maturing each crop?—We have statistics which we have obtained by experiments.

40,206. Have you got a time-table about the number of waterings required for different kinds of crops? I know the Agricultural Department have not done that yet?—Yes, we have done it; we have a table showing the number of waterings required for crops. I have a whole lot of papers with me showing that.

40,207. Is there any difference of opinion between the Bombay engineers and yourself regarding the delta of water required for rice?—Yes, there are differences of opinion.

40,208. It is a very substantial difference of opinion, is it not?—Not so very much.

40,209. It is on that ground, I suppose, that they made the requirement much more than we do?—They ask for more than what we think is necessary, but we are not going to fight them on that point. We do not wish to quarrel with them on that point at all. We are quite prepared to give them what they want, because we maintain there is enough water even to give them all that they demand.

40,210. Out of the delta of 3′ 6″, how much do you allow for evaporation due to the heat of the sun, and how much do you think goes under the soil and how much is absorbed by the crop?—I think I have given that in paragraph 7.

40,211. *The Chairman*: I think those things are given in the note, Sir Ganga Ram.

The Witness: Evaporation, I have said, is less than one-tenth of the amount of absorption, so that we take them both together.

40,212. *Sir Ganga Ram*: You admit that canal irrigation brings the subsoil up? But at what point does it go into the river? Will it go on increasing? —No, it comes to a state of equilibrium.

40,213. At what depth?—At a depth of about ten or twelve feet.

40,214. It will not go beyond that?—Except in some exceptional places.

40,215. Has that been established by research?—I think I have mentioned that somewhere.

40,216. What encouragement do you give to the zamindars for keeping their water-courses clean and less absorptive and *vice versâ*? Do you give them a more liberal quantity of water, or do you penalise those who do not keep their water-courses clean?—If we find them wasting water, we do not give them *kharaba*.

40,217. For instance, a man who does not keep his water-courses clean might claim *kharaba* for his bad crops. Supposing your outlet discharge is constant, and given two men, one grows a good crop and the other grows a bad crop on account of the bad state of his outlet and he claims *kharaba*, would you give him *kharaba* in that case?—In that case we would not give him *kharaba*.

40,218. That is the penalty you would impose?—That would be so; he would not be given any *kharaba*.

40,219. Do your Sub-Divisional Officers examine the point before determining the *kharaba*?—Undoubtedly, before *kharaba* is given, that matter is inquired into. If he has been receiving his proper quantity of water and if his crop has still failed, we would not give him *kharaba*.

40,220. In the old canal areas such as the Upper Doab canal areas, is it not a rule to irrigate only so much per cent. of the gross area in different canals?—On different canals there are different percentages.

40,221. And the calculation is made accordingly, I suppose?—Yes.

40,222. And if he uses more water for irrigation, you would not mind?—As long as he is not getting more than what we call the designed supply, we would not mind it.

40,223. You know that there is a remark in the Irrigation Commission's Report that 37 per cent. of the flood water goes into sea?—Yes.

40,224. In these circumstances, do you not think it should be our duty to conserve that water and utilise it to advantage?—Undoubtedly.

40,225. In that case would it not be advisable to run inundation canals during the *kharif* parallel to the main canals so as to increase the head of the outlet during the *kharif*? Supposing in the Ravi there are 100,000 cusecs, your maximum supply, is not your supply in the canal based on the minimum discharge of the river?—May I give you an instance of the latest of our canals which have the latest designs and the latest improvements. The capacity of those canals, I am referring to the Sutlej Valley project, is 48,000 cusecs,* whereas the amount of *rabi* supply is only 13,000 cusecs. The designed capacity of all the canals on the Sutlej Valley project is as much as 48,000 cusecs.

40,226. Is that design based on extra head being given to the outlet? Could not our Chenab canal be re-designed?—No, as you said, there are separate canals.

* Cubic feet per second.

40,227. Could it not be introduced in other canals too so as to make use of the flood water?—There are not areas for that. You would have to increase the intensity very much; all the other areas are already covered by canals.

40,228. Not all, you only allow 33 per cent.?—I say you would have to increase the intensity.

40,229. Yes, the intensity, but where is the harm in that?—It would lead to water-logging.

40,230. In fact, they do it because they cannot get sufficient water, and they have to do it by well irrigation?—In very few areas indeed. In some areas, there are lots I know, they gamble on rain.

40,231. Why should not the other canals be remodelled?—Because they get more rain in some areas. In some years when there is a heavy rainfall they will not even take the water that is there.

40,232. What use do you make of the rank grass that grows on the banks of the canals?—We let out the canal banks for grazing. *Sarkanda* is grown there.

40,233. The rank grass I mean?—We do not allow it to grow.

40,234. Have you applied to the Agricultural Department to give you some suggestions for keeping it as ensilage?—No, we have not, we try to prevent it growing on any of our canals.

40,235. But it grows all the same. I asked that question of Dr. Clouston and he said that that grass can be made into ensilage for fodder?—It is a matter for the Agricultural Department.

40,236. But I mean you have not applied to them with a view to its being put to that use?—No. Hitherto we have gone on the principle of trying to eradicate it as far as possible

40,237. Do you give any concession to the neighbouring villages to take the fuel which is on the canal banks at a cheaper rate than you would get from the contractor?—No.

40,238. You know our great aim is to prevent people using cowdung as fuel?—You mean fuel on our canal banks? You do not mean forest plantations? In the case of canal banks, the fact is that we cannot dispose of the produce of our plantations, as a rule, to the villagers.

40,239. Why?—Because there is no demand for it.

40,240. Even if you offer it at cheap rates?—No, they have enough in their own fields as a rule for their own wants. Our difficulty is to find a market for our plantation produce.
That is a point which ought to be noted.

40,241. You have not yet come to any definite conclusion whether the appointment of *zilladars* had better remain under the Canal Department or the Revenue Department?—I have written about that in my reply to Question 26, Statistics. Your question is about *zilladars* being done away with or being transferred to the Civil Department and canal *patwaris* being done away with. My opinion is given on this page here (referring to his reply to Question 26). It is more clearly and more briefly put here than I can do verbally.

40,242. *Sir Ganga Ram*: Some time ago we sanctioned one appointment of *zilladar* as a tentative experiment from the Agricultural College.—We still appoint *zilladars* from the Agricultural College.

40,243. No, no. We sanctioned an appointment of *zilladar* a B.Sc. of the Agricultural College. Has that been a success?—Our present method of recruiting *zilladars* is from the Agricultural College.

40,244. Not all of them?—Yes, almost entirely now.

40,245. We sanctioned only one appointment. You say that all *zilladars* are recruited from the Agricultural College.—We do not recruit from any other source except when we recruit from our own department by promotion of *patwaris* and *munshis*. There is no other outside source of recruitment.

40,246. *Mr. Calvert*: All direct appointments are from the Agricultural College?—Yes.

40,247. *Sir Ganga Ram*: All appointments?—Except promotions within the department, i.e., except promoted *patwaris* and *munshis*.

40,248. You are not in favour of reserving all *zilladar* appointments for the Agricultural College?—No, because we must hold out some higher appointments to our *patwaris* and *munshis*. We must give them some hope of promotion; otherwise, we would not get a good class of men.

40,249. Do not you think that those promoted *zilladars* are generally corrupt as compared with those who come from the Agricultural College?—No, I do not think we have noticed any difference of that kind so far.

40,250. *Professor Gangulee*: One or two questions with regard to the reclamation of alkali land: What steps do you take against the formation of alkali?—Drainage chiefly. We have a very complete system of drainage.

40,251. Do you take into consideration the type of soil you propose to irrigate before you introduce irrigation there?—No. I am afraid we do not. We do not withhold water from any particular area because of its soil. We would not withhold water even from an area where there was alkali forming. We would prefer to introduce a system of draining and try and wash out the alkali by applying canal water liberally and draining it off.

40,252. I was not referring to that type of soil. You know that if the subsoil contains an excessive amount of sodium, there is a great deal of danger of bringing the sodium carbonate or other salts to the surface under irrigation?—Yes.

40,253. Do you take any precautions in that case?—No, except to see that we have an extra good system of drains, if possible. That is the only practical remedy.

40,254. Drainage after the formation of alkali soil? But I am trying to find out whether you take any precautions against the formation of alkali?—Yes, a system of drainage is necessary even before the formation of alkali to prevent the alkali coming to the surface by keeping the subsoil water-table at a lower level.

40,255. Have you a laboratory in your department where you can test soils and things of that kind?—No. A laboratory is about to be built in our Research Department. Hitherto we have used the laboratory of the Agricultural College at Lyallpur for that purpose.

40,256. Now you feel the necessity for a separate department under your own control?—Yes, we have recently instituted a Research Department.

40,257. I am interested in the method you adopt to replace cowdung. Could you tell us to what extent that method is successful?—It is not very easy to explain to what extent it has been successful.

40,258. You have referred to a plantation. Is that a very recent plantation?—There is one on the lower end of the Upper Bari Doab canal. This plantation has been established for about 25 years in the Chungamanga forest, and it certainly has been a great source of fuel for the whole of the Province. The fuel goes from that forest all over the Province, so it is bound to have some effect in providing cheap fuel to the whole of the Province.

40,259. And release cowdung?—Undoubtedly, it must do that.

40,260. What is your experience, do you find cultivators still using cowdung as fuel?—I am afraid you still see them burning cowdung in the villages, but at the same time you see them using it as manure.

40,261. You let out your canal banks for grazing, do you?—Nearly all our canal banks. We get a fair amount of revenue from it, although in individual places it is a very small amount. The amount per mileage is small but the mileage is so great that the total is considerable.

40,262. Do you lease to individual cultivators or to a big cultivator who can sub-lease it to others?—We lease it generally to the local people.

40,263. Individually?—Generally individually: We give two or three miles to the neighbouring people.

40,264. To the whole village?—No, to one or two people. It is put in the name of one particular man, but this particular man probably takes all the cattle of the village to it. They make some sort of arrangement among themselves.

40,265. Is the scheme of colonisation you are referring to in this memorandum a success?—A great success. In fact, the canals could not have been made without these schemes of colonisation. The making of a canal and the colonisation of the land have to go hand in hand. You could not have the one without the other.

40,266. Do you get any trained educated Punjabi to reside in the colony? Do trained young men in the Agricultural College at Lyallpur settle down in those colonies? Do they get land from you and settle in the colony?—Well, a certain number, I suppose. It is rather difficult to say. The actual colonisation is not done by my department. It is done by the Civil Revenue Department.

What I am trying to find out is whether there are any educated men residing in the colony.

40,267. *The Chairman*: I think the witness has said that he does not know.

The Witness: Of course we have Sir Ganga Ram. He is one of our most famous landowners in the canal colony.

Professor Gangulee: He is a landowner, but he does not stay in the colony itself.

(Mr. Sangster then gave the Commission a map of the Punjab showing in different colours the existing irrigated areas and proposed irrigation areas, as well as areas where irrigation works are under construction.)

(The witness withdrew.)

Friday, February 18th, 1927.

DELHI.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.

Sir THOMAS MIDDLETON, K.B.E., C.B.

Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.

Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.

Mr. H. CALVERT, C.I.E., I.C.S.

Professor N. GANGULEE.

Dr. L. K. HYDER.

Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries.*)

Mr. R. E. GRANT GOVAN, of Govan Brothers, Ltd., Delhi, and Mr. S. A. BUNTING, of Messrs. Duncan, Stratton & Company, Delhi.

Memorandum on Grain Elevators in India by Messrs. Govan Brothers, Limited, Delhi.

PRESENT CONDITIONS.—India is one of the largest wheat-growing countries in the world; yet the methods employed in this country are primitive in the extreme. Granaries of solid construction are possessed only by the large exporting firms and by a few of the more up-to-date flour mills, and even these granaries own few of the scientific advantages which are to-day considered a *sine-qua-non* in practically all other wheat-growing countries. The solitary exception lies in an isolated experimental silo erected at Lyallpur by the Punjab Government. Grain is generally stored, both in bags and in bulk, in warehouses of defective construction. When stored in bulk the grain is placed on a layer of straw or chaff and covered with a similar layer. Damp penetrates with facility, and weevils, which infest the crevices of the walls and roof, quickly multiply in the fresh grain.

Another system in common use is storage in pits. These pits are lined with straw or chaff and sometimes with a plaster of mud or cowdung. The grain is stored in bulk and is protected above by a covering of straw, earth and thatch. Grain stored in this way is less liable to the attacks of weevil, but suffers from mould, resulting in discoloration and bad smell, while there is considerable loss due to the destruction by damp of the wheat adjacent to the walls.

Yet another plan is to store grain on plinths in the open, protected by a tarpaulin covering only. The disadvantages of this system are too obvious to require enumeration.

All these systems are open to most serious objections. Careful investigations have revealed the fact that wastage, due to the ravages of weevils, in grain stored in warehouses amounts to 2½ per cent. *per annum* of the grain so stored, while wastage on grain stored in pits by deterioration is no less than 5 per cent. In addition to these losses, depreciation in quality of pit-wheat reduces the value of such wheat by one anna per maund. Account must also be taken of the losses due to the accessibility to the grain of rats

and other vermin, and the objection in this case must be measured not merely by the damage done directly to the grain, but also to the facility afforded to the breeding of rats and the consequent increase of bubonic plague. Yet another loss, consequent on the present methods, is occasioned by shortages inseparable from the employment of manual labour, a shortage which may be accepted as 1 per cent. of grain so handled.

The above are only a few of the many disadvantages of the present system, but they suffice to demonstrate the imperative necessity of devising more efficient conditions. Taking a conservative estimate on the above basis, the annual loss under present conditions amounts to some 2½ per cent. of the total crop. The third wheat forecast of the year 1919-20 estimates the total yield as 10,092,000 tons. Thus, the loss that year on wheat alone, due almost entirely to the lack of an efficient storage and transit system, amounted to no less than 252,300 tons.

A SCHEME OF ELEVATORS FOR INDIA.—A rough scheme for the provision of elevators for India has been outlined in the technical note by Messrs. Henry Simon, Limited, attached to this memorandum. It may not be out of place, however, to give a brief description of the method of working this system.

The silos, as described by Messrs. Henry Simon, Limited, will consist of three classes:—

(1) Country elevators in wheat-producing districts.
(2) Terminal elevators at large consuming centres.
(3) Port elevators for export purposes.

We are principally concerned, at present, with the first two classes. The cultivator will bring his wheat to the nearest country elevator, either in sacks or in bulk. The wheat will be removed from the sacks into the elevator, where it is automatically cleaned, weighed and placed in the bins. The mill-dust, resulting from the cleaning operations, will be returned to him in his sacks, he will pay the elevator receiving charges, and will receive the Company's receipt for the whole amount of wheat placed in the bin. We will presume that he then sells his wheat to a grain merchant in Lahore. This grain merchant produces his receipt, in return for which the wheat is handed over to him and transferred in bulk railway wagons to the Lahore elevator, where it is similarly stored, and he is given a receipt. He may then sell the grain to a retail dealer in Lahore. This retail dealer produces the receipt, and the wheat is handed over to him, in bulk or in sacks as he may desire. Or the merchant may desire it to be sent for export, in which case it again enters bulk railway wagons and proceeds to the Karachi or other Port elevator.

ADVANTAGES.—The advantages of this briefly-described system as compared with the present one are too numerous to detail in full. Perhaps the most important of them is that all wastage is reduced to a minimum. The wheat no longer lies in dirty pits or warehouses suffering from the attacks of weevils and damp. It is stored in a clean, weather-proof and insect-proof bin. When transported by rail it does not lie for days on railway platforms, exposed to the weather and to the depredations of birds and insects. It remains in the bin until the wagons are alongside the elevator, ready to receive it. Not until the wheat finally leaves the elevator for consumption does it become liable to the various forms of deterioration and wastage mentioned in the first part of this note, and the saving thus effected is enormous.

THE POSITION OF THE CULTIVATOR.—The more prosperous cultivators, under present conditions, are able to hold their wheat until a favourable moment for selling, but while awaiting this moment their wheat is undergoing deterioration and wastage, which will be avoided by the use of elevators. The poorer cultivators are nowadays compelled to sell as soon

as possible, in order to pay their revenue and other obligations, and though by reason of their quick sale they do not suffer from deterioration, they do suffer heavy pecuniary loss from the necessity of selling at deflated rates. This loss they will now be able to avoid, for, if they wish to hold their grain, they will be able to obtain an advance on their granary receipts of at least 75 per cent. of the value of their grain from the co-operative banks or town banks. It may probably be safely asserted that, at present, they do not receive as much as 75 per cent. of the value of their products, under the various sale conditions which exist. It may be alleged that this system may encourage the holding of crops for a rise. This is not so in reality, for a sliding scale of storage charges will penalise the unreasonable holding of stocks. It must also be admitted that speculators in wheat do exist at the present time, and the point is that, under the elevator system, such holding up as there may be will benefit, not the middlemen, but the cultivator himself. Other benefits enjoyed by the cultivator include the prevention of unnecessary transport to and from the markets, as, under present conditions, the villager not infrequently carts his grain to the market only to take it back again, owing to the absence of buyers or disagreement as to price. Under the granary system he will be able to cart his wheat to the district elevator and deposit it there until such time as he wishes to sell.

Primarily, therefore, the elevator system would be of inestimable value to the vast majority of the Indian population, viz., the cultivator.

Increase of Value of Export Wheat.—Indian wheat for European markets has always been of secondary value, by reason of deteriorated quality (due to methods of storage) and of excessive refraction, and further, of the inability of the exporter to arrange suitable mixed qualities for export. Elevators, therefore, will be of immense value to the country in general by increasing the export value of grain, due to its proper hygienic storage, cleaning and mixing, and to the possibility of discharging it into ships in bulk.

The Jute Question.—It may be said that the withdrawal of the demand for bags for the handling of grain, resulting from the introduction of the granary system, will affect adversely, *pro tanto*, the vast Jute Industry. Bags, certainly, will not be used to the same extent as formerly, but it cannot be argued that any such loss is comparable with the benefit which will be secured by the saving of the cost and usage of bags. Moreover, the demand for jute in other directions, owing to the increased cost of tin and other packing materials, will, it is believed, more than compensate this important industry for the loss of this outlet for its manufactures. The mere fact that grain is carried in bulk and not in bags will enhance its value, and it can hardly be proposed that the country should forfeit the benefits of a granary system merely in order to retain for the jute trade an appreciable market for its manufactures.

Elimination of Manual Labour.—One of the greatest advantages of the silo system is the elimination of all unnecessary manual labour and the inevitable losses resulting therefrom. The wheat, from the time of its arrival at the elevator till it is handed over to the final purchaser, is never touched by hand.

Necessary Conditions for Proceeding.—It is obvious that an undertaking of this magnitude cannot be contemplated without exploring in every direction the various factors indispensable to success. Attached as an appendix (Appendix 1) to this memorandum is a rough estimate of a single terminal elevator, and the profits which may reasonably be expected therefrom, together with a statement of charges and wastages incidental to the present system. Attractive as the prospect may appear from this estimate, it is dependent on official support. The first essential factor is that the

whole system should be approved by Government, actively supported by Government, and its administration guaranteed by Government. Taken in detail the official support necessary for the scheme consists of the following:—

(1) *Provision of facilities for the acquistion of land.*—The success of a silo scheme depends on the location of elevators in suitable places. Such elevators must be on or near a good road, must adjoin the railway, and must be so situated that sidings can be run alongside them. It may well occur that from speculative or other causes, the only suitable site for a particular elevator may be unobtainable except at a prohibitive figure. In such a case the assistance of the Government in acquiring the land at a fair price is desired.

(2) *Government guarantee of receipts and supervision of management.*—The Indian cultivator is one of the most conservative of human beings, and is unwilling to depart from any time-honoured custom without some definite guarantee. He would be satisfied, probably, if the receipts issued by the Elevator Company bore the Government guarantee. This guarantee would not involve the Government in any pecuniary liability; it would merely be a guarantee that the same quality and quantity of wheat received at any particular elevator would again be delivered by such elevator on surrender of the receipt. Loss could only occur by criminal collusion in regard to weights, forgery of receipts, and by actual theft. The theft risk is negligible; forgery of receipts has made little headway on the railways; and criminal collusion is a matter for efficient management. It would be possible to devise some means whereby the Company would indemnify the Government, up to a reasonable figure, against loss caused by reason of this guarantee and by the Company's negligence. The Government guarantee is also necessary in order to make these receipts acceptable in financial circles. A sufficiently large Granary system will involve the storing and transport of grain to the value of many crores of rupees, and it is natural to suppose that the banks and financial circles would hardly be expected, in the initial stages, to accept the Company's receipts as security when they are not aware of the total value of such receipts outstanding, unless all such receipts bear the Government guarantee.

In approaching the Government for this guarantee the Company is, it is contended, asking only for a reasonable amount of Government assistance to the scheme. It is to be noted that the Government are not being approached either for capital or for a guarantee for shareholders.

It will be necessary to entrust to the Government the power to fix the maximum rates, and this the Company are prepared to do, subject to reasonable conditions in regard to the return that the maximum rates so fixed might yield the shareholders of the Company. Furthermore, it will be necessary to request the Government to provide, by legislation, for the supervision by Government of the administration and management of the Granary system, and, if necessary, active interference by Government to secure that the Company carry out their requirements. The required inspection would, of course, also be included.

(3) *Guarantee of freedom from competition.*—Another important factor in the introduction of the Granary system is the necessity of having an assurance that any other Companies desiring to imitate the pioneer Company will not be afforded support or assistance from the Government, at all events for 25 years, and in exchange for this undertaking the Company are prepared to give assurance to the Government that they will, so far as their resources permit and conditions indicate, extend their granaries to meet the public requirements. It is not suggested that the pioneer Company desires a monopoly of the granary system for India; but, knowing the inherent weaknesses of the country in regard to imitation (for instance, the Ginning trade,

Flour milling trade, &c.), it is essential, in connection with the securing of the initial capital required, that the Company be reasonably protected against unfair competition. The success of this granary system will be of vital importance to the country, and it is, therefore, in the interests of the whole community that unhealthy competition, which might cause a general failure, should be prevented.

(4) *Co-operation of Railways.*—The co-operation of the Railways of India is necessary to ensure success by the provision of bulk transit wagons, adequate siding facilities, and, where necessary, a lease of land adjoining the railway. It is presumed that there will be no difficulty whatever in securing the co-operation of the Railway Companies. It is suggested that assistance should be granted by the provision of reduced rates for transit of grain in bulk, as compared with the rate for tranist in bags. This is regarded as justifiable by reason of the prevention of wear and tear in rolling stock and platforms, the reduction of congestion, the ability to carry heavier loads in bulk than in bags, and much quicker and more efficient handling of loading and unloading.

(5) *Military elevators.*—It is understood that a scheme is on foot to erect Government elevators for the better transit and storage of wheat for military purposes. It is suggested that it would be for the mutual benefit of Government and of the Company if such schemes were abandoned, on condition that the Company agreed to set aside a fixed amount of storage for Government requirements.

(6) *Propaganda and collection of information.*—A vast amount of information will have to be collected before it is possible to consider the final details of the scheme (of which the estimate attached—Appendix 2 to this note—is merely a provisional outline). It is hoped that Government will be willing to assist, where local knowledge is required, in the production of this information through official channels. Further, when the time comes for propaganda, it is hoped that district officials may be instructed to explain to the cultivator, whom it is difficult to reach by the ordinary methods of advertisement, the benefits which will accrue to him by an intelligent grasp of the opportunities offered by this Elevator scheme.

NOTE BY MESSRS. HENRY SIMSON, LIMITED, S. C.—*Classes of Elevators.*—The elevators required are of three distinct types.

(1) Elevators for receiving the grain at country stations, storing the grain until such times as it can be transported by rail to the large stations.

(2) Terminal elevators at the larger stations and consuming centres. These would be of a larger capacity say, at least 20,000 tons, with provision for storage when required to a much larger capacity.

(3) Port elevators for receiving the grain from the railways and loading out to steamers for export.

To make the scheme complete, elevators would be required for these three distinct purposes, but it is possible to divide the wheat to be handled into two distinct classes, namely, wheat required for internal consumption in the country, and wheat required for export to foreign countries, and it may be desirable to consider separately the two parts of the whole scheme.

For dealing with internal consumption the first two types of elevators would be sufficient, and the third type of elevator would only be necessary in case export grain is also dealt with.

Country elevators.—Country elevators for receiving grain from farmers are at the present time chiefly constructed of timber in the United States and Canada, but concrete has been adopted for these elevators in the case of Australia and it is also proposed in the case of South Africa.

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The principal reason for the difference in practice is that in North America the grain is kept separate in the silo bins for each farmer or owner of the grain, consequently a number of small bins are required, whereas in Australia the grain has so far been handled in large bins on behalf of the Government and is not separated for each small producer.

The concrete bins are cheaper if built in large bins, but the timber is cheaper for small bins. Concrete has the advantage of being fireproof, and is also impervious to the attacks of insects.

Where possible, concrete bins should be used, but at the smaller country stations it would be more economical to use timber bins.

In North America a standard small country station elevator, such as is recommended by the Canadian Government, has a total capacity of 1,000 tons, divided into bins holding 50 tons each.

The concrete bins built in Australia hold 250 tons or more each, and the elevator may consist of one or more of these bins.

The proposed bins for South Africa hold 250 tons each, and the elevator consists of one or more bins as required, provision being allowed for extension by adding more bins.

The following is a summary and comparison of each method of construction in different countries:—

In	Capacity of each bin.	Total capacity.	Price per ton.	Total price.
	Tons.	Tons.	£	£
America timber	50	1,000	5	5,000
South Africa concrete ...	250	3,000	6	18,000
Australia concrete	250	3,000	4	12,000

Concrete construction could not satisfactorily be adopted on elevators with bins less than 100 tons capacity each.

A depreciation of 2½ per cent. should be allowed on the contrete construction, but 5 per cent. should be allowed on timber construction. It is also necessary to allow an insurance premium of £1 per cent. per annum on grain stored in timber bins, whereas the grain stored in concrete bins can be safely carried without insurance. The depreciation on machinery in both cases should be 5 per cent.

Any of the above elevators can be built in such a way as to allow of easy extension without much extra cost in machinery.

Terminal Elevators.—The terminal elevators would be built in central positions where grain is consumed in fairly large quantities. These elevators should be constructed of reinforced concrete, because for a large unit of this kind concrete would be cheaper than any other form of construction, and there is no fire risk or upkeep of building required.

These elevators would be equipped with appliances for receiving grain from carts or railway wagons whether in bulk or in bag, and the machinery would be suitable for discharging from the elevator back to railway wagons for transit to port or to flour mills in bag or bulk as may be desired.

These terminal elevators would be constructed in the first instance with capacities of 15,000 to 20,000 tons, but arranged so that storage capacity could be readily increased at a relatively small expense, the receiving and delivering machinery installed at the beginning serving both the original buildings and the extensions.

The following summary shows the cost of elevators in accordance with the above notes:—

Capacity.	Cost per ton,	Price.	Extension cost per ton.
	£	£	£
15,000	12	180,000	8
20,000	12	240,000	8

This type of elevator is capable of turning over its full capacity six to eight times per annum. On a conservative basis six times can be safely estimated in fixing charges for the use of the elevator.

Port Elevators.—These elevators are generally constructed similar to the terminal elevators described above, but are equipped with more elaborate loading out appliances and are usually of a large holding and handling capacity.

To arrive at the cost of these elevators it is necessary to add about £2 per ton on to the cost given for terminal elevators.

The Manchester Granary which was carried out at pre-war prices for a cost of £5 per ton is an expensively equipped plant which forms a good basis for arriving at the cost of a port elevator.

Running and maintenance.—Attached herewith is statement (Appendix 3) showing the permanent staff required to operate the Manchester Ship Canal No. 2 Elevator. It will be noted that no allowance is made for interest on cost of elevator depreciation, or repairs. These should be allowed before the installation can be considered a paying proposition. Our figures for these items are as follows:—

Interest ... ... 8 %
Depreciation ... buildings... ... 2½ %
Depreciation ... machinery ... 5 %
} Approximate total cost 3¾ %.

Another instance may be useful.

The following figures were the estimates used by the Australian Government when dealing with this problem in 1916:—

Total charges, including labour, power—

Interest	@ 5 per cent.
Depreciation	@ 2 per cent.
Sinking Fund	@ 2 per cent.
Country elevators 0·8*d.* per bushel, say ...	2 8 per ton.
Terminal elevators 0·6*d.* per bushel	2 0 per ton.

Summary—As a commencement we would suggest the following plants being constructed:—

	Tons each.	Price.
		£
50 Country Elevators, average capacity ...	3,000	
total capacity... ...	150,000	900,000
Terminal Elevators at Lahore, capacity ...	15,000	180,000
Terminal Elevators at Delhi, capacity ...	15,000	180,000
Terminal Elevators at Lyallpur, capacity ...	20,000	240,000
Terminal Elevators at Bombay, capacity ...	20,000	240,000
Terminal Elevators at Calcutta, capacity ...	20,000	240,000
	240,000	1,980,000

Messrs. R. E. Grant Govan and S. A. Bunting.

If it is decided to proceed with elevators for export grain in addition to local use, it would be necessary to install an elevator at Karachi with a capacity of at least 50,000 tons.

Advantages of introducing elevators.—The following is a short summary of the advantages of introducing elevators:—

There is a saving in handling the grain owing to the abolition of bags which, according to general estimates, may amount to 6*s.* per ton.

The grain can be kept in good condition, consequently there is no loss from weevils, vermin, or by decomposition; these losses are at present approximately as follows:—

	Per cent.
Loss from weevils	2½
Loss from decomposition in pits	5

The handling cost at the elevators will be considerably less than the handling of bags, and also will be less laborious to the men doing this work.

The cost of freight on the railways, and (if port elevators are adopted) on ships, should be reduced, because the saving in space is approximately 10 per cent.

The accuracy of weighing is much greater because the grain can be passed over either automatic or hand-operated scales and cannot be faked.

The grain can be cleaned by machinery which will show up any foreign substances placed in the grain, such as stones, and would also ensure that material shipped from the elevator does not contain above a certain percentage of foreign matter. This saves freight on such material as sticks, straw, dirt, &c.

It would be desirable that grain passing into terminal elevators is inspected both as regards weight and quality by Government representatives, and, if found desirable at a later date, a system of grading could be introduced which would protect users of the grain and also encourage the farmers to keep their grain clean with a view to getting a better price.

General Notes.—It is interesting to know that practically all the grain handled in North America is now handled on the bulk system, and that other countries, such as South America, Australia, South Africa, are introducing this method of handling grain. Most of the first-class ports in Europe are specially equipped for discharging grain in bulk, and grain received in bags is looked on with disfavour by dock authorities. Consequently, ships bringing Indian grain in bulk would receive more consideration at European ports, and, in addition, can be discharged much more rapidly than they are at the present time.

In dealing with this problem it is, in our opinion, desirable to instal the complete system, in the first place, radiating from large consuming centres, and, finally, linking up these systems with the ports so as to facilitate the export of grain. This would, in our opinion, inevitably follow the introduction of complete series of elevators in the interior, because the advantages for exporting grain are very large and fully appreciated outside India.

V.—(APPENDICES).

Appendix 1.

Rough estimate of a single terminal elevator.

The present cost of handling grain is:—

Bagging and incidental expenses per maund, 1a. 3p to 2a. 3p.
Use of bags, 5p.
Shortage in weight, 1 per cent.
Deterioration: (*a*) Pit wheat, 5 per cent.; (*b*) Godown wheat, 2½ per cent.

Our proposals are a chain of elevators in wheat-producing centres (Country elevators) and consuming centres (Terminal elevators), all built with provision for large expansion. Also port elevators for the export of wheat at the principal ports.

Capacity.—Karachi, 50,000. Calcutta and Bombay, 20,000 tons (with additional storage). Lyallpur, 20,000 tons. Delhi and Lahore, 15,000 tons.

The above is merely a tentative proposal which will doubtless be subjected to considerable modification and alteration when our investigations are completed.

An estimate of £12 per ton of capacity for complete erection should be on the liberal side (the new Manchester granary cost £5 per ton).

An estimate of revenue and running expenses based on each elevator handling in a year six times its capacity and having forty weeks of full storage rent should be a reasonably approximate estimate (the Manchester granary handles on an average seven times its capacity).

Appendix 2.

Suggested estimate for terminal elevator.

	Charge per maund. Rs. a. p.	Charge per ton. Rs. a. p.	Gross approximate.
Receiving and delivering 90,000 tons ...	0 1 6	2 8 6	2,30,000
Storage rent 15,000 tons for 40 weeks at per week	0 0 2	0 4 6	1,60,000
	Gross Income... ...		3,90,000
Deduct—			
Interest @ 7% on capital of Rs. 18,00,000		1,26,000	
Depreciation @ 5% per annum on Rs. 18,00,000 (cost of elevator)...		90,000	2,16,000
	Balance		1,74,000

It will be seen that, after paying the shareholders a dividend of 7 per cent. and allowing 5 per cent. for depreciation, the sum of Rs.1,74,000 (one hundred and seventy-four thousand) remains for maintenance. On 90,000 tons this allows a charge of:—

	Rs.	a.	p.
Per ton	1	14	11
Per maund	0	1	2

It has not been possible as yet to work out the probable expenditure per ton or maund of wheat handled, as the expenditure will vary according to the different kinds of power used, but it may be accepted that the allowance given is an extremely liberal one, and it is probable that a

able proportion of the balance shown would be available for distribution to shareholders.

It should be noted that the proposed handling charge is considerably cheaper than the existing expense under present conditions. Further, the proposed rent charge is absurdly low and would necessarily have to be on an increasing scale according to length of storage, to prevent the elevator being "cornered" by speculators. In practice, income from rent should be appreciably greater than is estimated above.

Appendix 3.

Staff of No. 2 Grain Elevator, Manchester Ship Canal.

	Per annum. £
1 Superintendent	500
3 Clerks at £200	600
3 Floor Foremen at £250	750
3 Weighers at £250	750
4 Belt and Spouting at £200	800
20 Sackers, Sheeters at £150	3,000
	6,400
Engineering Staff—	
1 Foreman Mechanic (part time) } 1 Foreman Electrician (part time) }	200
1 Fitter	250
3 Labourers, oiling and greasing	450
	900
Total	7,300

The foreman mechanic and electrician are responsible for two elevators each of 40,000 tons capacity, and also other engineering work on the Dock.

The amount of grain handled in the new elevator is approximately 250,000 tons per annum, the cost of permanent staff working out at 8*d.* per ton. Nearly one-half of this cost is accounted for by the sacking off prices.

Replies to the Questionnaire.

Question 20 (*c*).—Marketing.—My evidence deals only with the question of grain elevators.

Present conditions.—India is one of the largest wheat-growing countries in the world; yet the methods employed in this country for cleaning, storing and transporting grain are primitive in the extreme. Granaries of solid construction are possessed only by the large exporting firms and by a few of the more up-to-date flour mills, and even these granaries own few of the scientific advantages which are to-day considered a *sine qua non* in practically all other wheat-growing countries. The solitary exception lies in an isolated experimental silo erected at Lyallpur by the Punjab Government.

Present system of storage of grain.—Grain is generally stored, both in bags and in bulk, in warehouses of defective construction. When stored in bulk the grain is placed on a layer of straw or chaff and covered with a similar layer. Dampness penetrates with facility and weevils, which infest

the crevices of the walls and roof, quickly multiply in the fresh grain Another system in common use is storage in pits. These pits are lined with straw or chaff and sometimes with a plaster of mud or cowdung. The grain is stored in bulk and is protected by a covering of straw, earth and thatch. Grain stored in this way is less liable to the attacks of weevil but suffers from mould, resulting in discoloration and bad smell, while there is considerable loss due to the destruction by damp of the wheat adjacent to the walls. Yet another plan is to store grain on plinths in the open protected by a tarpaulin covering only. The disadvantages of this system are too obvious to require enumeration.

All these systems are open to most serious objections. Careful investigations have revealed the fact that wastage due to the ravages of weevils, in grain stored in warehouses, amounts to 2½ per cent. *per annum* of the grain so stored, while wastage on grain stored in pits by deterioration is no less than 5 per cent. In addition to these losses, depreciation in quality of pit wheat reduces the value of such wheat by one anna per maund. Account must also be taken of the losses due to the accessibility to the grain of rats and other vermin and the objection in this case must be measured not merely by the damage done directly to the grain, but also to the facilities afforded to the breeding of rats and the consequent increase of bubonic plague. Yet another loss consequent on the present methods is occasioned by shortages inseparable from the employment of manual labour, a shortage which may be accepted as 1 per cent. of grain so handled.

The above are only a few of the many disadvantages of the present system but they suffice to demonstrate the imperative necessity of devising more efficient conditions. Taking a conservative estimate on the above basis, the annual loss under present conditions amounts to some 2¼ per cent. of the total crop. Assuming the wheat crop alone amounts to ten million tons this means a loss by depreciation of some 250,000 tons—worth over three crores of rupees annually.

Proposed system of elevators.—The provision of a system of elevators for the receiving, cleaning, storing and rapid despatch of grain is very desirable, and I will endeavour briefly to outline the advantages of such a system.

The elevators will consist of three classes.

(1) Country elevators in wheat-producing districts.
(2) Terminal elevators at large consuming centres.
(3) Port elevators for export purposes.

Let us consider how the first two classes will benefit the cultivator. The cultivator will bring his wheat to the nearest country elevator either in sacks or in bulk. The wheat will be removed from the sacks into the elevator where it is automatically cleaned, weighed and placed in the bins. The mill dust resulting from the cleaning operations will be returned to him in his sacks, he will pay the elevator receiving charges and will receive the company's receipt for the whole amount of wheat placed in the bin. We will presume that he then sells his wheat to a grain merchant in another town, say Lahore. This grain merchant produces his receipt in return for which the wheat is handed over to him and transferred in bulk railway wagons to the Lahore elevator, where it is similarly stored, and he is given a receipt. He may then sell the grain to a retail dealer in Lahore. This retail dealer produces the receipt and the wheat is handed over to him in bulk or in sacks as he may desire. Or the merchant may desire it to be sent for export, in which case it again enters bulk railway wagons and proceeds to the Karachi or other port elevator.

Advantages of proposed system.—The advantages of this briefly described system as compared with the present one are too numerous to detail in full. Perhaps the most important of them is that all wastage is reduced to a minimum. The wheat no longer lies in dirty pits or warehouses suffering from the attacks of weevils and damp. It is stored in a clean,

weather-proof and insect-proof bin. When transported by rail it does not lie for days on railway platforms exposed to the weather and to the depredations of birds and insects. It remains in the bin until the wagons are alongside the elevator ready to receive it. Not until the wheat finally leaves the elevator for consumption does it become liable to the various forms of deterioration and wastage mentioned in the first part of this note, and the saving thus effected is enormous. A great saving will also be effected by avoiding the necessity of using gunnybags for storing and transporting wheat.

The position of the cultivator.—The more prosperous cultivators, under present conditions, may be able to hold their wheat until a favourable moment for selling, but while awaiting this moment their wheat is undergoing deterioration and wastage which will be avoided by the use of elevators. The poorer cultivators are nowadays compelled to sell as soon as possible in order to pay their revenue and other obligations, and though by reason of their quick sale they do not suffer from deterioration, they do suffer heavy pecuniary loss from the necessity of selling at deflated rates. This loss they will now be able to avoid, for if they wish to hold their grain they will be able to obtain an advance on their granary receipts of at least 75 per cent. of the value of their grain from the co-operative banks or town banks. It may probably be safely asserted that at present they do not receive as much as 75 per cent. of the value of their products under the various sale conditions which exist. It may be alleged that this system may encourage the holding of crops for a rise. This is not so in reality, for a sliding scale of storage charges will penalise the unreasonable holding of stocks. It must also be admitted that speculators in wheat do exist at the present time, and the point is that under the elevator system, such holding up as there may be will benefit, not the middleman, but the cultivator himself. Other benefits enjoyed by the cultivator include the prevention of unnecessary transport to and from the markets as, under present conditions, the villager not infrequently carts his grain to the market only to take it back again owing to the absence of buyers or disagreement as to price. Under the granary system he will be able to cart his wheat to the district elevator and deposit it there until such time as he wishes to sell.

Another important factor is that if wheat is received in an elevator it can be graded for quality according to a fixed grading scale laid down by the Government, and this grading will facilitate ready disposal without prior inspection and will also encourage cultivators to improve the quality of their crops.

Primarily, therefore, the elevator system would be of inestimable value to the vast majority of the Indian population, viz., the cultivator.

Increase of value of export wheat.—As regards the third class of elevator, namely, port elevators for export purposes there are numerous other important factors in connection with the export of grain to European markets in bulk which I do not propose to go into in this note as they can be more properly investigated if and when the Royal Commission takes evidence in England.

Indian wheat for European markets has always been of secondary value by reason of deteriorated quality (due to methods of storage) and of excessive refraction, and, further, of the inability of the exporter to arrange suitable mixed qualities for export. Elevators, therefore, will be of immense value to the country in general by increasing the export value of grain, due to its proper hygienic storage, cleaning and mixing, and to the possibility of discharging it into ships in bulk.

General conclusion.—The whole subject of an elevator system for India is a matter which should be entrusted to an expert committee including

amongst its number at least one member having full experience of the working of elevators in other countries such as Canada, Australia and South Africa, and I urge that the Royal Commission on Agriculture should recommend that this investigation should be undertaken by the Government of India.

Oral Evidence.

40,268. *The Chairman*: Mr. Grant Govan, you are of Messrs. Govan Brothers, Limited?—Yes.

40,269. And you are accompanied by Mr. Bunting, of Messrs. Duncan, Stratton and Company?—Yes.

40,270. What is the relationship between these two firms?—There is no relationship, except that Messrs. Duncan, Stratton are agents in this country for Messrs. Henry Simon, who are the big elevator experts in Manchester.

40,271. And what is the scope of the activities of Messrs. Govan Brothers?—We are connected with the Delhi Flour Mills, and we have a certain knowledge with regard to wheat handling.

40,272. Have Messrs. Govan Brothers no interest in the elevator business?—No.

40,273. Are you personally associated with the grain elevator business at all?—I cannot say I am. There are no elevators at present in India, except an experimental one at Lyallpur; but we have certain elevator arrangements in our own mills.

40,274. But neither you nor your firm are agents for any grain elevator concern?—No.

40,275. We are indebted to you for your note of evidence, and we have also had for some months before us a note on the same subject of grain elevators, which, I think, you have probably seen. Did you prepare it?—I think that is the one which we prepared. I was at home in the spring, but I believe that it was handed to a member of the Commission.

40,276. The note is entitled "Memorandum on grain elevators in India, by Messrs. Govan Brothers, Limited, Delhi." Have you yourself seen that note?—Yes, that is the one I am referring to.

40,277. First of all, I should like to know if either of you gentlemen would like to say anything at this stage in addition to the written note of evidence that you have provided us with?—I do not think that there is anything to say.

40,278. Have you yet seen the report of the special inquiry which has been initiated by the North-Western Railway?—No. (*Mr. Bunting*): I have seen it.* We have sent it on to Messrs. Henry Simon, and we have their criticisms of the report here.

40,279. That report has not been sufficiently long before the Commission to enable us to go into it in detail, but if I should refer to it, you would, doubtless, know the document?—(*Mr. Bunting*): I have seen a rough draft of it, but I have not seen it in its finally amended form. Major Gordon referred the draft to us for any criticisms that we might have to make with regard to it.

40,280. *The Chairman* (*to Mr. Govan*): Probably you will answer the questions on the note, and we shall assume that Mr. Bunting agrees with you unless he says something to the contrary?—Yes.

* *Report on Grain Elevators*, by Major Gordon (North Western Railway). Lahore, N.W.R. Press, 1927.

40,281. Have the views of your firm, as put forward in this note, been founded upon any special inquiry or examination of the subject in the Punjab itself?—That inquiry was carried out in 1920. A member of my firm, together with Mr. Watson, of the firm of Messrs. Henry Simon, toured the Punjab for four months in the spring, and the figures contained in the detailed report, the long return which you have seen were based on that investigation.

40,282. Is your firm interested in export at all?—No.

40,283. The grain elevator would be useful if it was installed mainly in the export business, would it not?—I think that that is a very valuable factor, but my evidence is essentially in connection with the storage and movement of grain. I have not tackled the export question.

40,284. Is your firm drawing much wheat from the Punjab to-day?—Yes, about 80 per cent.

40,285. Of your total turnover of wheat?—Yes.

40,286. How do you carry your wheat from the Punjab to Delhi?—In sacks by rail.

40,287. Leaving out, for the moment, the question of export, where would you suggest having your terminal elevator for the internal consumption trade?—In those centres where grain is brought in for internal consumption, in big cities like Delhi, Bombay, Calcutta, Lucknow, Cawnpore and Lahore.

40,288. Now, then, beginning at the cultivator's end of the story, do you suggest that the first elevator at the production end should be a so-called public elevator or a private elevator? Would you suggest individual storage available to a particular cultivator, or would you suggest the pooling system?—I feel myself in regard to that question that, to start with, in educating the Indian cultivator to use the elevator, it would probably be necessary to keep his parcel of wheat intact and in separate bins.

40,289. So that you are going for the individual storage method at first?—Yes. (*Mr. Bunting*): I think that would prove very difficult.

40,290. And very expensive, would it not?—Yes; it would mean a tremendous number of bins.

40,291. What is the smallest amount of wheat coming in from an individual cultivator that can be economically dealt with by a grain elevator?—For individual bins about fifty tons.

40,292. Would that be much of a contribution to the problem of the small cultivator in India?—In what way?

40,293. Do you think many small cultivators have fifty tons of wheat to bring in?—I am afraid I cannot answer that question.

40,294. It is a very material point, is it not, from the cultivator's angle?—Yes.

40,295. Plainly, so far as the smaller cultivator goes, there would require to be combination amongst individual cultivators and the bulking of produce of stable holdings before you can come to the point where the individual cultivator can use your elevator at all?—Yes, that is assuming that individual holdings cannot be kept separate.

40,296. Now, in cases where the pooling system is conducted, what is the smallest unit which you would suggest dealing in?—In regard to this question, the size of the elevator would vary in different localities according to the requirements. The smallest unit of a country elevator would be

about 1,000 tons, as a whole. (*Mr. Bunting*): The lowest unit in which you could deal economically would be one ton.

40,297. And the fifty tons, which was referred to a little while ago, was intended for what?—The fifty tons was a complete bin by itself for the bigger cultivators, on the assumption that they are not prepared at the present moment to mix their wheats.

40,298. Would you agree that in the main the surveys of this problem which have been made have been directed towards the export trade, Mr. Govan?—Yes. (*Mr. Bunting*): There was a Railway Board Committee on this subject in 1909, which took a good deal of evidence. They went into the matter of the internal consumption and movement of the grain crop thoroughly.

40,299. And what recommendations as to grain elevators did they make?—I think the bulk of the evidence was more or less in favour of grain elevators, and I think it was as a result of that that a start was made at Lyallpur; but I am not quite sure about the history of that.

40,300. Are either of you gentlemen familiar with the technical problems involved in shipment from elevators?—(*Mr. Bunting*): To some extent; I may explain that I am a stopgap to Mr. Watson, who has, unfortunately, had to go to South Africa.

40,301. Is it the case that to get the full advantage of port elevators, special equipment has to be fitted in the ship?—(*Mr. Bunting*): We have made some inquiries from the Shipping Companies that carry grain from Karachi, and they mostly agree that no great changes are necessary. Some special boards have to be put in various holds, and in some cases it is specified that a certain number of rolls of sacks shall be put on top of the wheat in bulk in ships. They are, on the whole, in favour of it.

40,302. You say that from the correspondence that you have had with them?—Yes.

40,303. There has been no official pronouncement by the shipping lines?—No, none whatever.

40,304. To go back for a moment, I want to get from you gentlemen, together or individually, some clear idea of what your specific proposal is. I do not know whether you agree, Mr. Bunting, but apparently the separate bin plan is hardly feasible. Do you still adhere to that system?—(*Mr. Govan*): It is a system in force in North America that in the country elevators separate bins are provided before it comes into the central elevators where it is taken over by Government.

40,305. Not in every case, I think?—I do not know whether it is in every case; my information is that that is the system in force in North America. I do not think it is a very serious point except in regard to the question of the method under which country elevators should be introduced. The point is whether an Indian cultivator will have sufficient faith in an elevator system to hand his wheat over to be mixed up in bins with other people's wheat, take his receipt and think he is going to get his wheat back in the end.

40,306. In the case where a cultivator hires a separate bin, he is really hiring machinery for storing his wheat and cleaning it conveniently?—Yes.

40,307. That is at the first elevator nearest the point of production. Who decides when that wheat is to be moved for sale?—My suggestion there is that in regard to the handling at the receiving elevator there would be a sliding scale of storage rates resulting in a prohibitive rate after a very short period, necessitating the moving of that wheat.

40,308. So as to prevent over-long holding up for a market?—Yes, it will have to move on.

40,309. I judge from that that you suggest the cultivator should nominally be the judge as to when his wheat should be sold, but in fact your scale of charges should be so fixed as to compel him within a reasonable limit of time to instruct the manager of the elevator to sell his wheat?—To move the wheat, yes.

40,310. To move the wheat; not to sell it?—No.

40,311. What is the next stage?—The next stage is that that wheat has to proceed either to a consuming area, where there will be a terminal elevator for storage, or to the port elevator for export.

40,312. Take the first instance, where the wheat is being moved for internal consumption; you say the wheat still belongs to the cultivator?—It belongs to the owner of the receipt.

40,313. It is moved as a unit?—Yes.

40,314. Is that a practical proposal?—The wheat represented by that receipt is moved. If the storage is in a general bin, that quantity of wheat would be moved; if it is in separate bins, that parcel of wheat would be moved.

40,315. I do not wish to assume there is unanimity between you gentlemen in these matters where there is not. I should like to hear your view, Mr. Bunting?—(*Mr. Bunting*): I am afraid our view, based on experience in other countries, is that the pooling system is the only one that is a real relief to the transport system and can so cheapen costs of storage and transport to the cultivator. (*Mr. Govan*): I should like to say I am in agreement with Mr. Bunting as to the ultimate result; that is bound to come in two or three years; but the answer I gave you was in regard to to the commencement of country elevators until the cultivator has had some education.

40,316. I quite appreciate your point, that the suggestion is for a first and educative stage, but my difficulty is to conceive how you are going to deal with the second phase. You have got this unit of wheat in the cultivator's bin, which is hired; you say very properly that the wheat is the property not necessarily of the cultivator but of the owner of the receipt; the owner of the receipt decides to move his wheat to the terminal elevator for internal consumption; plainly at that stage you have got to pool and give a new receipt (or pool and found on the old receipt), or you have got to provide again separate storage for that unit in the terminal elevator; you must do one of the two?—Yes, I agree with regard to the pooling in the terminal elevator, where it would be graded on receipt.

40,317. So that you think the cultivator would be less inclined to be suspicious of a system of pooling in the secondary stage than he would of a system of pooling in the primary stage?—Yes, because by that time I imagine the receipt will be in the hands of the wheat dealers and not of the cultivator.

40,318. One attraction put forward in favour of the elevator is that the cultivator would be able himself to reap some of the advantage resulting from the capacity to hold up his wheat for a better market?—Yes.

40,319. Do you not envisage the possibility of the cultivator wishing himself to hold the receipt until sale takes place?—Yes, I envisage that in the future but not in the preliminary stage.

40,320. Mr. Bunting, are you mainly interested in the problem as it affects internal consumption, or export?—(*Mr. Bunting*): We are interested in the construction of elevators.

40,321. You do not mind where you put them?—No.

40,322. But would you agree in the main that the case for elevators, so far as they would be designed to deal with the export trade, must rest upon the assumption that a steady export trade will be maintained, and indeed that in the future there should be an increase in the exportable surplus of wheat from India?—I think a certain proportion of export is necessary to ensure that there shall be sufficient acreage under wheat in the country to provide for the feeding of the population in a bad year. Suppose a bad year occurs once every five years, export would then diminish, but the stimulus given by the export market to the growing of wheat would provide a surplus which would be useful in bad years.

40,323. But you do not suggest that the need for an export as a stimulus to the sowing of a sufficient acreage to provide the minimum required for safety is in effect operating at this moment, do you?—During the last year or two export has diminished, and that has had some effect, but if a better price were available from abroad, as a result of improved transport and storage facilities, we should see export reviving.

40,324. It is the effect on the individual cultivator's mind of the relation between the probable price of wheat, and therefore his profits, in the following years, compared with the profit likely to be earned by growing other crops; that is the way in which the factors work, is it not?—If the price of wheat in England is some figure bearing a constant relation to the price of wheat in India, as the result of the stable export, the cultivator will get a slightly better price from England. It will tend to keep up the price here, of course.

40,325. What I am concerned to get from you is whether you hold that there is likely in the future to be a sufficiently constant surplus for export to justify the investment of a very considerable capital sum in elevators designed to facilitate the export of wheat?—Yes, a huge new area is being developed in the Punjab; it cannot all be sown with cotton. Cotton, of course, has received a setback this year, so that it is not a fair test. We have the Sutlej Valley project coming on and there are the Sind projects; some proportion of those areas must be sown with wheat.

40,326. And do you argue from that that there will necessarily follow an enhancement in the surplus available for export?—Yes, I do.

40,327. Do you know that the pre-war exports from Karachi averaged a million tons from 1910 to 1914?—I have the figures here.

40,328. Perhaps you will check me if I am wrong?—They touch a million tons at times.

40,329. In the post-war periods exports from Karachi from 1918 to 1926 were only 327,000 tons?—Yes, they have fallen off. There was over a million tons exported in 1924-25.

40,330. Nevertheless the average for 1918 to 1926 was 327,000 tons?—Yes, the average has dropped.

40,331. And do you know that that reduction took place in spite of no inconsiderable increase of the irrigated area of the Punjab?—Yes; it is the extra demand in the country; the people are eating more wheat and the standard of living generally has risen.

40,332. They are eating wheat rather than other foods?—I suppose so.

40,333. In substitution for other grains?—Yes.

40,334. Is that an indication of a rise in the standard of living?—We take it so.

40,335. Do you think, having regard to those figures, you are wise to argue that over the next fifteen years one effect of the increased area coming

under irrigation will be to increase the exportable surplus of wheat?—Yes. The population is not increasing at the same pace that the new area available will be increasing at, and there must be a limit to the amount of wheat they can eat per head.

40,336. Do you imagine that after the last acre has been irrigated the population in the newly-irrigated area will not go on increasing?—It will, but I think that is sufficiently far ahead to allow an export elevator to do useful work in the meantime.

40,337. You think you could repay capital and interest in the meantime?—I think so.

40,338. That is the economic crux of the situation?—Yes.

40,339. *Mr. Calvert*: By "exports" you mean exports from India, not from the Province?—Yes.

40,340. *The Chairman*: How far do you accept the Karachi figures as an index of the exports from India?—They represent the bulk of the wheat exported; the rest is negligible.

40,341. When the suggestion is made that Government should take this risk, it is the problem which you and I have been discussing which Government will have to take into consideration before coming to a decision?—This only affects a portion (though a large one, I admit) of the expenditure involved. The rest is on the country and terminal elevators.

40,342. How far would a system of elevators, designed on an ideal plan to facilitate the export of grain from the Punjab through Karachi, be available for wheat designed for internal consumption?—Practically the whole of the installation, with the exception of the port elevator at Karachi, would be equally of use for wheat intended for other Provinces or for large consuming centres in India.

40,343. Are you thinking of intermediate stages between the primary elevator and the terminal elevator for internal consumption? Are you thinking of intermediate elevators?—No, the wheat would go direct from country elevators to large centres such as Lahore.

40,344. Direct from the elevator of primary collection to the terminal elevator?—Yes. We presume, of course, a loss of identity; once the cultivator has received a receipt for so much grade "A" or grade "B" wheat, or whatever it is, he has done with it. Orders will then come to the elevator authorities to deliver so much wheat at a certain centre.

40,345. Mr. Govan, in your note I see no suggestion that there should be any guarantee of the certificate by Government?—(*Mr. Govan*): There is in the detailed note.

40,346. But not in your note of evidence. Do you insist on that?—Yes, most strongly.

40,347. It is a very material point?—I think it is the most material point in the scheme. I do not think the elevators would command any confidence in this country unless backed by Government guarantee.

40,348. Can you cite any instance, in other countries, of Government guaranteeing the certificates?—No, except with regard to grading. They guarantee the grading, but not the quantity.

40,349. It is not quite true to say they guarantee the grading, is it?—I understand the grading is conducted by a Government department.

40,350. Inspected, but not conducted?—(*Mr. Bunting*): In South Africa it is. The Administration of Railways and Harbours operates the whole thing in South Africa. South Africa is the country which has most recently adopted this system on a large scale.

40,351. Then I am wrong on that. In South Africa, although the Government guarantees the grading in that sense, there is no guarantee of the certificate by Government, is there?—(*Mr. Bunting*): I understand they take entire responsibility for that. (*Mr. Govan*): It is a Government organisation in South Africa, I understand. It is Government capital. (*Mr. Bunting*): A definite average deduction is made (I believe it is 1 per cent.) for handling.

40,352. The pooling system exists?—Yes. (*Mr. Govan*): I have here a Report of the General Manager of Railways and Harbours, Union of South Africa, who controls the elevators. (*Mr. Bunting*): That is last year's report.

40,353. Government not only owns the plant, but also operates it?—(*Mr. Govan*): Yes.

40,354. Is there much active opposition from the jute or jute manufacturing interests to the proposal to build elevators?—There is bound to be strong opposition. (*Mr. Bunting*): It has not been expressed yet. (*Mr. Govan*): We have not had it expressed, but my own view is there is bound to be strong opposition to a reduction in the use of carrying bags in this country.

40,355. Do you hold the view that it will be essential in the initial stages to offer the cultivator storage on an individual basis?—No. I do not insist on that point at all; I merely suggest it may be advisable to consider that method of starting the country elevator.

40,356. *Sir Henry Lawrence*: Can you give us some general figures with regard to the capital expenditure involved by a complete system of elevators? It would be reasonable to take the average outturn of wheat at 10,000,000 tons, would it not?—Yes.

40,357. The value of that might be taken at £100,000,000 sterling, in the roundest possible figures?—Yes, that would be the approximate figure.

40,358. What is the percentage of loss at the present time owing to deterioration, mishandling and so on?—We have only very approximate figures to go on, but the opinion is that the loss from weevil works out at 2½ per cent. of all grain in bags. That figure is based on a much higher percentage of loss in the later months of the year, but for the whole crop it works out at 2½ per cent.

40,359. Are there any other losses?—Yes, owing to the present method of storage there are. There is the loss occurring owing to dampness when the wheat is stored in pits; in the case of a pit holding 800 maunds there may be thirty to forty maunds which become unfit for human consumption and can only be used for cattle-food.

40,360. You suggest there is 2½ per cent. from weevil and 5 per cent. from other losses, making 7½ per cent. all told?—No, because the grain which suffers from weevil is not stored in pits. It is a loss of 5 per cent. on grain stored in pits and 2½ per cent. on grain stored in bags.

40,361. Would that give an all-round figure of about 4 per cent.?—Yes.

40,362. About £4,000,000 a year?—Yes.

40,363. What would be the capital expenditure required for a complete system of elevators to deal with the whole of the wheat in the country?—It would not be practicable to start off with a complete system, but one might start off with a system sufficient to handle a reasonable proportion of the crop to begin with; the figures we worked out were approximately for elevators of 240,000 tons capacity.

40,364. Could you give that as cost per ton?—The cost per ton to-day, I understand, is in the neighbourhood of £8. (*Mr. Bunting*): Simply-equipped country elevators in the Punjab could be done for about Rs.60 a ton.

40,365. *The Chairman*: In what material?—Reinforced concrete or brick.

40,366. *Sir Henry Lawrence*: Does that include the machinery as well?—Yes.

40,367. *Sir Thomas Middleton*: Does it include one-ton bins?—No.

40,368. How much would that add?—(*Mr. Govan*): I have not suggested one-ton bins.

40,369. *Sir Henry Lawrence*: That is per ton of storage capacity?—Yes.

40,370. But it would deal with a great deal more than that in a season. I want the figure per ton dealt with, if you have such figures available?—(*Mr. Bunting*): You would have to divide that figure by five, judging from our experience in other countries.

40,371. That would be about £1 per ton dealt with?—Yes, with five turnovers in a season.

40,372. It would be an all-inclusive rate?—Yes, but only for country elevators, which are very simply equipped; not for port elevators, or perhaps even for terminal elevators.

40,373. Those would be more expensive?—Much.

40,374. Have you worked out a figure including terminal and port elevators?—We worked out a figure roughly for the North-Western Railway system, and I think it came out at two to five as between the expenditure on the port elevator at Karachi and the expenditure on some eighty country elevators in the Punjab. We have only dealt at present with this Punjab area. In the United Provinces there would be no great amount for export, so the average expenditure on elevators would be no less, because only country and terminal elevators would be required.

40,375. What percentage would the port elevator add to the cost?—Our firm gave a rough price for the port elevator at Karachi of £9 10*s.* per ton. Having inspected the site, I think that is a little low.

40,376. That is per ton of storage capacity?—Yes. It would turn over much more often, of course.

40,377. It might turn over thirty times?—Not as much as that. We put it at twenty times. It would not work out more expensive per ton of turnover for that reason. We envisage a 40,000 tons capacity elevator to start with, increasing in a short time to 80,000 tons. It is more expensive, but a small item comparatively to the total produce.

40,378. The total export has seldom exceeded 10 per cent., and recently it has been as low as 5 per cent.; is that right?—Yes; but the area affected is the Punjab and Sind and 15 per cent. of the United Provinces.

40,379. And on that your figure of export is 12 per cent.?—It is higher than that.

40,380. 20 per cent.?— Yes.

40,381. Last year it was 12 per cent.?—Last year it was less; it was 12·78 per cent. for 1925 from all the area.

40,382. But the larger part of your scheme, I take it, would have reference to the internal consumption which in itself is 90 per cent. of the output?—Yes.

40,383. And for that part of the scheme the figures you first quoted apply?—Yes, Rs.60 per ton; it is a very rough figure; it requires to be worked out in great detail. The prices of the material and labour vary very considerably over the area.

40,384. But you have been applying your mind to it, and that is the result?—Yes.

40,385. Can you give us any figure for the saving in transport and bagging charges per ton dealt with?—I think Major Gordon had better answer that question in Lahore. But taking 10 bags per ton and 10 annas a bag as the average price, and allowing 7½*d.* per bag as compensation for useless bags realised in England, there would be a saving of 2*d.* roughly per bag or 2*s.* per ton. That can only be given as the general figure for bags. Of course, bags occupy about 12 per cent. more space in a ship, and that would give some reduction in freight, a very small advantage over the off-setting disadvantages. The saving in the railway transport of course depends on the pooling system, and it may reach a very large figure; but it is a very difficult one to estimate in advance.

40,386. You look forward to Government operating this system with respect to grading and general administration of these elevators. Have you any figure to give about the expenditure to the Government per ton for an efficient system of grading and administration? What is the Canadian experience in regard to inspection?—I do not know about that. The Manchester figure works out at 8*d.* a ton. I think the South African figures work out a little bit less.

40,387. You have no definite reports as to the method of administration in South Africa, Canada or New South Wales?—I have not got them here with me; you can have them at Lahore.*

40,388. *Sir Ganga Ram*: Mr. Grant Govan, you deal with different kinds of wheat. Can you give us milling properties of the different kinds of wheat, for example, Pusa 4, Pusa 12, Punjab 8, Punjab 18, and so on?—(*Mr. Govan*): In regard to the production of flour from the different grains?

40,389. Yes, on economical grounds; which is advantageous to the producer so far as the value of the wheat is concerned?—I will supply you a note on that.

40,390. You buy wheat largely from Lyallpur and other centres, and you carry it in bags?—Yes.

40,391. Supposing the railway provided you with wagons to carry them in bulk, would you prefer that?—Yes, very much.

40,392. You would not be afraid of leakage in that way?—No, certainly not; not if the wagons were efficient.

40,393. Would you save in money?—We would save all the cost involved in sending our empty bags up to the different wheat markets and the deterioration of the bags also, as also the railway freight on them.

40,394. Could you give us an idea as to what would be the saving per ton under this method? You can send us the information later on?—Yes.

40,395. You consume in the flour mills a large quantity of wheat. Why do you not set up a terminal elevator?—We have got one.

40,396. What is its capacity?—27,000 maunds or 1,000 tons.

40,397. For how many days' requirements?—Roughly, fifteen days over and above our ordinary storage capacity for our wheat in bags.

40,398. Is the old system of *khatis* being done away with? It was largely used in the United Provinces?—It is not done away with.

40,399. How does that system compare with the elevator system in regard to the cost, considering both advantages and disadvantages? Would it be a gain or a loss on economic grounds?—In this note prepared in 1920 it was worked out that the cost of storage under an elevator system would be cheaper for a limited period than the cost of storage in pits, and that the 5 per cent. deterioration in the pit wheat would be avoided by the use of the elevator.

* *Vide* Appendix I.

40,400. When you consider the cost of elevators, you consider the interest charges, depreciation and all that?—Yes; it is given in this note.

40,401. When you buy wheat in Lyallpur and other centres, what standard do you insist upon as compared with the so-called London standard?—The standard is an allowance of 5 per cent. refraction; that is foreign grains and anything that is not capable of being used in the mill in the form of wheat.

40,402. Do you insist upon that standard when you are buying from *mandis*?—We buy on those terms, and when wheat comes in and is analysed on arrival in the mill, 5 per cent. is allowed free for refraction and any excess is deducted from the bill.

40,403. Supposing the wheat is altogether pure; do you allow any premium on that?—No.

40,404. Then the calculation is on one side only?—I have not seen pure wheat coming into the mill.

40,405. Pardon me: that is rather a sweeping assertion. You can get any amount of pure wheat?—It has never come into the mill. By the time it comes to my mill it has got 5 per cent. refraction in it.

40,406. If you come to my factory I can show you any amount of pure wheat?—The system of purchasing is giving 5 per cent. allowance.

40,407. Supposing you get pure wheat, do you allow 5 per cent. premium? —We have never considered the subject yet because we cannot get pure wheat.

40,408. How do you account for this fact? It is my experience that the middleman buys dearer than the exporter and sells to the exporter at a cheaper rate?—Perhaps the same reason; he buys the wheat and sends it to me, and when it arrives in my mill it has probably got 5 per cent. refraction.

40,409. Who does that?—Probably the middleman.

40,410. Why do you not insist upon buying the wheat yourself directly through agents?—We buy through the *artya* who is a middleman; we cannot buy directly from the cultivator.

40,411. *Sir Thomas Middleton*: In estimating Rs.60 per ton for your country elevator, what size of bin do you allow for?—It is rather a difficult point; but certainly about 200 tons in a bin would be the smallest on economic grounds.

40,412. How much would that add to the cost?—It is very hard to say off-hand; but it is not very much.

40,413. Do you agree that as a means of introducing the elevator system it would be desirable to supply the unit storage for each cultivator?—It might be desirable; I think it is very difficult.

40,414. Mr. Govan attaches great importance to this point; you have no doubt discussed it between yourselves?—No, we have not so far done so. (*Mr. Govan*): We have not had a preliminary discussion before meeting here

40,415. Mr. Govan, you have heard the discussion on your view, and I would like to know whether you still adhere to your opinion that it is very important that the cultivator should see his own wheat in the elevator?—I adhere to that view to this extent, that I do not think cultivators will be induced to put their wheat into a general bin to commence with unless some method of education through district officials is undertaken.

40,416. Would you not also agree that to give effect to your opinion a very much smaller unit than fifty tons would be essential; this weight represents some 200 acres of wheat?—Yes, probably it would.

40,417. What does the ordinary cultivator's wheat crop amount to?—It is very difficult to answer that question unless an investigation is carried out on the spot. It must vary very considerably.

40,418. *Dr. Hyder*: To take up this last point, while fifty tons would be about 1,350 maunds do you not know from your own experience of the cultivators in this country that the bulk of them do not have this annual output of 1,350 maunds?—I am afraid I am not qualified to answer that, because we cannot get into direct touch with the cultivator.

40,419. Now with regard to the elevator system one criticism made is this, that it results in cheap handling but dear storage. What have you gentlemen got to say on this point of cheap handling and dear storage? We are now comparing things as they exist in India with things as they would appear when you have an elevator system?—(*Mr. Bunting*): I think the South African figure was for storage in the off season when the elevators are not required to turn it over.

40,420. In giving your evidence you suggest that these country elevators or terminal elevators would have to have a turnover of five times. Do you think that is possible in the case of wheat?—Between April and July, which is the wheat exporting season, I think we could rely on that. But I think it has been shown by Major Gordon that it would pay even three times.

40,421. Could you make use of these elevators by storing other kinds of grain, such as maize, etc.?—Yes, the Manchester elevator has even been used for groundnuts.

40,422. To pass on to another matter: the economies which would result from the system of elevators would to a large extent go to the railways, is that not so?—The railways ought to benefit considerably, but I think the largest benefit will be derived by the safe storage of wheat and the elimination of the loss caused by weevils, vermin, also through damp, and again by the disappearance of the multitudinous stages in handling.

40,423. Could you work this system of country elevators without the active help and co-operation of the railways?—No.

40,424. You know that most of the railways in India are State-owned. Do you not think it would be better to entrust the railways with the construction and operation of this system of elevators?—Yes, I do.

40,425. That is to say the elevators should be State-owned?—On the whole I think so.

Mr. Govan: I agree with that.

40,426. You referred to the experience of other countries such as North America, for instance. I was wondering whether you are familiar with the latest developments in Canada, Mr. Bunting, where they feel very much dissatisfied with these elevator companies as a result of which the farmers' co-operative societies have to a large extent taken over this system?—Yes.

40,427. With regard to this difficulty which arises from the smallness of the units, do you think it would be better if the country elevator induced the co-operative societies to hand over the grain? That would facilitate the working of the system if the co-operative societies operated it instead of the individual cultivator?—(*Mr. Govan*): Yes. (*Mr. Bunting*): I think that in the first stages the individual cultivator would not have to deal direct with the elevator. But if the elevators do, as in other countries, put up daily postings of prices offered, the cultivator will get to know about this, will realise his own disabilities and will take more and more to co-operative societies. It would be a great inducement to realise the benefits.

40,428. To obviate this wastefulness of dealing with small consignments of wheat, if the consignments come in bulk through the co-operative societies would you be able to store in bulk instead of in small quantities?—The

elevator which our firm designed consists of only four bins and at least four grades are necessary. The minimum size we recommended was 1,000 tons of storage capacity, which amounts to something like 250 tons per bin. I think the South African experience is that the 1,000 tons proposed has already proved too small. We have selected some eighty stations in the Punjab as being places suitable for the erection of country elevators with the intention of bringing the country elevator within carting distance of every place where wheat is cultivated to any extent. We have arrived at that conclusion from the railway transport figures, making different classifications at places from which 10,000 tons per year can be sent away by rail. We divided the figures by five turnovers and made out a list of these elevators ignoring all those that work out at less than 1,000 tons capacity. But if you take a twenty mile square with an elevator in the centre of it, and if you take one-tenth of that as being under wheat, that would be a good average figure, and it would give you something like 2,000 tons as the minimum capacity of the elevator.

40,429. Are you speaking of the elevator as a whole? I was thinking more of the small quantities of wheat brought in by the individual cultivator, where you would have to keep every man's wheat separate?—I do not see how it is to be done.

40,430. *The Chairman*: I would like to be clear about this question of the number of grades in its bearing upon the minimum total capacity of the elevator. Is 250 tons per bin the economic minimum?—I would not say that; but that is a convenient figure for the size of a bin. Of course you would have in an elevator, say, eight bins of that size. You would have, say, two more bins sub-divided into a quarter of that size for dealing with small consignments.

40,431. You do not contemplate a five grade basis? You contemplate an eight or a nine grade basis at least, do you not?—To start with, probably there would be quite as many as that. But we hope that after a little time it might be possible to decrease the number of grades. Experience varies so much in different countries that it is impossible, in advance, to say what the effect of an elevator system would be on standardising the grading and so eliminating too great a variety.

40,432. How about the suitability of Indian wheat for grading*?—I would ask you to wait for an answer to that question till you examine one of our men at Lahore who has had considerable experience in wheat.

40,433. *Dr. Hyder*: With regard to this question of grading, supposing the system were worked by the Railways how would you prevent the danger of the subordinates of the railway or the elevators combining with the cultivator in order to raise the grades and so cheating the purchaser?—(*Mr. Bunting*): Consider the position of the manager of an elevator; he is receiving numerous consignments from hundreds of different people; in the busy season he will be receiving 100 different consignments in a day; he has to grade them and put them in the bins according to their grades, and order the receipt to be issued. Within a week or two he has to despatch so many hundreds of tons for which he would receive orders, to Karachi, Lahore or Delhi. If he has given a cultivator say a better grade than the wheat is worth, the man at Karachi who has to receive it will immediately complain, and it will not take many weeks to localise any dishonest grading. It would be an almost impossible proposition to consider collusion between the receiver at Karachi and the despatcher at an up-country elevator.

40,434. The receipt is issued, let us say, at Lyallpur, for grade "A," and the grain is actually delivered from Multan; the receipt says the holder is entitled to grade "A," but what he in fact receives is below grade "A";

* *Vide* Appendix II.

do you think you will be able to fix the responsibility?—I think any dishonest grading will be immediately found out because it would involve collusion of the whole of the elevator staff all over the country and their customers.

40,435. You do not think there will be any *bakshees* going?—The only way in which the manager of an elevator could make money would be by giving a receipt for a smaller quantity than is received, and I think the cultivators or the people bringing the wheat would very soon find that out. If he gives a receipt for a larger quantity than is received, how is he going to make it good? In the terminal and port elevators they will have people quite able to analyse the content of moisture and the retraction of the wheat, and if that has been tampered with they will be able to say so at once.

40,436. *Sir James MacKenna*: Is it not a fact that there is much more enthusiasm for elevators displayed by railway companies and manufacturers of elevators than by the actual traders in grain?—Yes, I think that is quite understandable.

40,437. I am speaking from my own experience in trying to tackle the rice problem in Burma; there was no enthusiasm on the part of the trade?—It is hardly to be expected.

40,438. *Professor Gangulee*: In this proposed system of elevators, how would you arrange for drying grains; suppose you introduce grains with a moisture content of more than 12½ per cent.?—Indian grain does not suffer from that; Indian grain is famous for its dryness. The usual method that is adopted where necessary is that a large pipe is inserted into the centre of the bin with grooves in it. Special drying bins in fact are fitted in this way. Dry air is blown through the wheat.

40,439. Will that add to the cost of the elevators?—It depends on the extent of it. At all the port elevators or large terminal elevators there would be a hospital section for dealing with wheat that has arrived in poor condition.

40,440. Is it necessary to treat these bins or elevators with carbon bisulphide for weevil?—I think experience is rather against that; it has been done a good deal, but the general experience is that both the cost and the complication of it is not worth while, that quite good results are obtained by merely turning the wheat over, which is done every two or three weeks in a storage anyway.

40,441. In this system which you suggest of country, terminal and port elevators, how would you divide the wheat into two classes, one for internal consumption and one for export? One quality of wheat is exported and another quality is used for internal consumption?—I do not know that any distinction has been made in quality; the exporters at present at Karachi mix certain proportions and supply what is called fair average quality.

40,442. The foreign markets prefer hard wheat to soft wheat?—Yes; of course, the hard wheat is valuable for mixing purposes; it would be graded separately.

40,443. Would it be necessary to have standard weights and measures?—All wheat entering and leaving elevators, up country and at Karachi, will go through automatic weighing machines. (*Mr. Govan*): I do not think there will be any difficulty in Karachi; there may be in Bombay.

40,444. As you know, there are various weights and measures in this country?—Yes.

40,445. What would be the effect of the system of elevators on general market conditions; would it tend to stabilise the market?—(*Mr. Bunting*): The fact that an elevator receipt represents something for which Government

guarantees the quality and the quantity, would make marketing very much easier.

40,446. Would you make the elevator receipt a negotiable document?—Yes, certainly.

40,447. *Mr. Calvert*: Mr. Bunting, I think you are getting a report from South Africa as to the success of their new scheme of elevators?—We have got a short report here dated the 31st March, 1925, from South Africa; it is not quite in the form we wanted.

40,448. But what is the general effect of the report? Does it express satisfaction with the new scheme?—Very much so; I think they complain that the size of the country elevators was under-estimated and they will soon require extension. (*Mr. Govan*): The Parliamentary Board have recommended the construction of 132 country railway stations and two terminal elevators at a cost of £3,500,000.

40,449. But the experiment has hardly been going on long enough to lead to a really definite decision?—(*Mr. Bunting*): I think it has; it was first opened in 1923 with 33 country elevators and one Cape Town elevator. I think the Durban section has come into operation this year.

40,450. Were those elevators for wheat or for maize?—For maize.

40,451. Mr. Govan, you told Sir Ganga Ram that you could not buy direct from the cultivators; have you tried?—(*Mr. Govan*): Yes, we have tried; the cultivator is not in a position at present to get into touch with a flour mill.

40,452. Is your buying agent an Indian?—We have *artyas* in practically every single wheat station.

40,453. You employ the *artya*?—We buy through the *artyas* who get their brokerage.

40,454. You have not tried to buy direct through co-operative societies?—No, no co-operative society has approached us in regard to it. The only person who approached us direct was Major Van Renen who approached us to sell wheat.

40,455. Is the omission to buy direct from the cultivator in any way connected with the fact that you are employing as your agents people of the same caste as the *artyas*?—No, I do not think so; I think the reason is that the cultivator is incapable of dealing with a mill situated some hundred miles away; that is the reason why he has to deal with his village *artya*.

40,456. Is Sonepat 100 miles from Delhi?—It is 28 miles from Delhi.

40,457. Is not there a co-operative commission shop there that can deal with wheat?—There may be.

40,458. The omission to deal direct with the cultivator is probably due to insufficient effort to get into touch with him?—The inability to deal wth the co-operative society may be, but I do not think there is any possibility of dealing with the cultivator at present; an effort might perhaps be made to deal with co-operative societies, but the co-operative societies have made no efforts to deal with the consumers.

40,459. I think you also said that the cultivator would not be prepared to bulk his wheat with other parcels?—I say that in regard to the initial stages of the elevator system, during the first two or three years until he understands that he is secure; we will find it, in my opinion, very difficult to get him to hand over his wheat if he knows it is being mixed in a general bin from the bottom of which comes some other wheat which may be of the same grade but which is not his.

40,460. But that opinion is not based on any experience?—It is only based on my opinion of the great unwillingness of cultivators to take on anything new.

40,461. But as you have not got into direct touch with the cultivators, this opinion is not based on intimate personal knowledge of the cultivator?—It is based on my knowledge of the Indian cultivator.

40,462. Which has not been obtained from direct connection with the cultivator?—Except from my experience of eighteen years in this country.

40,463. You told Sir Thomas Middleton you could not get in direct touch with the cultivators?—That is so.

40,464. I do not understand your difficulty. In these big *mandis* we have co-operative shops?—As I say, I have never had any suggestion of co-operative societies offering us wheat or offering wheat to millers in the *mandis*. They may offer it to the *artyas*, but the only people who offer us wheat in these *mandis* are the *artyas*.

40,465. That may be because you deal through a class of man who is inimical to co-operation?—Very likely.

40,466. The present tendency, I understand, is for an increasing quantity of wheat to go down-country, towards Bengal rather than towards the ports?—Yes. I think the population of the south are taking to eating more wheat.

40,467. Although there is an increasing outturn of wheat, due to the wheat area coming more and more under irrigation, the extra outturn is being consumed inside the country?—Yes.

40,468. Until that new demand is saturated there is not likely to be an increase in exports from the country?—It is all a question of whether the increased production is going to exceed the rapidity with which the population of India is going to take to higher grade foodstuffs. In the last ten years the people of India have appreciably taken to higher grade foodstuffs, and probably that movement will continue with increasing prosperity; but I think the output of wheat is likely to increase more rapidly than its consumption in India.

40,469. As a matter of fact, there has been no tendency for wheat exports to increase during the present century?—No.

40,470. Although there has been a very wide extension of irrigation?—I I put that down to the fact that India, in the last few years anyhow, has been better off and able to buy superior foodstuffs.

40,471. Or that Indians have been able to consume what they produce, instead of being compelled to sell?—Yes, on the assumption that they are consuming wheat. In the old days they had to sell their wheat and buy an inferior foodstuff. (*Mr. Bunting*): I think the new areas are mostly being developed nearer to the point of export, so that they will be favoured as compared with areas previously brought under irrigation by being able to export their wheat rather than send it to the heavy consuming centres in the United Provinces and Bengal.

40,472. At the same time, you are assuming that an extension of irrigation into new tracts will mean an extension of the area under wheat?—To a certain extent. It cannot all go under cotton.

40,473. But actually, in spite of the enormous extension of irrigation in the last 27 years, there has not been a large increase of the area under wheat?—No, but this is new country altogether. Some of the Canal Colonies in the Punjab were, too, of course.

40,474. Irrigated wheat means a low canal rate?—Yes.

40,475. You cannot charge the same canal rate for wheat as you can for cotton or sugarcane?—No.

40,476. Do you not think the tendency will be for the canal people to persuade the irrigators to grow a crop other than wheat, a crop which

will bear a higher canal rate?—No doubt it will, but there is a great deal of land which cannot be used for cotton, and the cotton and wheat seasons do not coincide.

40,477. You were in the Irrigation Department in the United Provinces?—Yes.

40,478. Do not the United Provinces canals favour sugarcane as against wheat?—They may, but that does not mean the whole area can be supplied with water for sugarcane; there is not enough water for it. My argument is that a certain proportion of wheat must be grown in this new area.

40,479. That assumes the canal rates are so low as to make irrigated wheat profitable?—Yes. There must always be a *rabi* crop, and wheat must be the chief portion of it. The *rabi* crop may be small compared with the *kharif*, but there must always be a *rabi* crop. It is pertinent to observe that in Iraq, where a very ambitious cotton-growing scheme was contemplated, they have found from the course of world markets in the last year or two that they must cut down their cotton programme very materially and sow a certain proportion of wheat. That is an indication of a general trend.

40,480. Do you anticipate in your old Province any appreciable expansion of irrigated wheat from tube-wells?—No, it would be too expensive.

40,481. So you are looking to the Punjab Canal Colonies for your increase of wheat?—And Sind.

40,482. Not to any increase in the United Provinces?—I hardly imagine so.

40,483. *Mr. Kamat*: In this scheme of elevators which you contemplate for the Punjab, have you in mind the handling and storage of wheat only, or of other crops as well?—As I said just now, every form of grain and pulse can be handled in an elevator, and is so handled. We have actually received ground nuts at our Manchester elevator.

40,484. Ground nuts are for export; let us take other crops. If the cultivator deals with the elevator for one crop, but for another has to go to the *bania*, how will that work?—The seasons do not, as a rule, coincide, and where they do not coincide, other crops can be stored in the elevators and handled in bulk.

40,485. The cultivator is likely to find it inconvenient if he deals with the elevator for one crop and has to go to the *bania* for another. From his point of view, do you not think that will be an inconvenient arrangement?—It may be, but if it becomes the general practice of the country it will not make much difference.

40,486. You think he will go to the elevator just for one crop?—(*Mr. Govan*): I do not think his inability to go to the elevator for his other crops will affect him.

40,487. Have you worked out the comparative cost to the cultivator of going to the *bania* for the marketing of his goods and of going to the elevator?—It is in the original note we sent in. We have worked out the estimated charge for using the elevator and have given also the cost of handling by present methods.

40,488. Which is cheaper?—It is 1 anna 6 pies against 1 anna 8 pies.

40,489. *Sir Ganga Ram*: Have you seen the Lyallpur elevator?—(*Mr. Bunting*): No, not myself.

40,490. Do you know the cost of it?—I know it was out of all proportion.

40,491. It was very extravagant?—Yes.

40,492. With all your experience in Africa and elsewhere, have you worked out a cheaper design suitable for India?—We have made various attempts to adapt our designs to Indian conditions.

40,493. Have you brought out the cheapest design consistent with efficiency for the Punjab?—That is what we are endeavouring to do now.

40,494. You have not yet arrived at anything?—No, but we have various designs in preparation.

40,495. *Sir Thomas Middleton*: You indicated you would expect to fill a country elevator about five times in a season?—Yes, between April and July.

40,496. What about the remainder of the period?—It would be very desirable that grain for export and for immediate movement to inland centres should be first served between April and July. From the beginning of the monsoon it would be a good thing to encourage storage in the elevators by dropping the storage rate slightly and to discourage it again later, after the monsoon, by raising the rate slightly.

40,497. So that, all the losses, which fall on the wheat and which Mr. Govan has indicated, could not possibly be obviated by a system of elevators sufficient to deal with the trade of the country? Elevators sufficient to deal with the trade would presumably be filled five times over?—In these three months. During the rest of the year they could be used for storage.

40,498. At low rates?—Yes, during the rains, because people should be encouraged to store during the rains, when most of the damage occurs. After the rains they store only with a view to getting a better price; I think we could say that? (*Mr. Govan*): Yes.

40,499. I wanted to get at the possibility of obviating the damage through your system?—(*Mr. Bunting*): It can be obviated by despatching to the port, or to the inland centres where there is sufficient accommodation or where it is being dealt with at once, as much as possible between April and July, and by storing to the full capacity of the elevators from July to October. By that time the greater part of the dangerous period of the year is over.

40,500. The greater portion of the loss to which Mr. Govan has referred does not occur between April and July, but subsequently?—Yes, so that the storage capacity of the elevators is definitely a measure of what can be safeguarded for the ensuing three months.

40,501. The storage capacity would never be more than one-fifth of the crop?—Yes, because you would have got rid of the grain exported and sent to up-country centres.

40,502. Would you agree it would not be more than one-third?—Yes.

40,503. So that one-third could be protected during that part of the year when losses are most severe?—Yes. That is a general statement, of course.

40,504. Actually, the losses run highest in October and November, do they not? The losses from weevil are highest just after the rains?—(*Mr. Govan*): Yes, I think so.

40,505. *The Chairman*: You mentioned that special trucks will have to be provided for carrying grain in bulk; do they exist now?—They do not exist. In other countries there has been some difficulty about providing special trucks because in other countries the proportion of open trucks to covered trucks is very large; in this country it is the other way.

40,506. It is the covered truck that you want?—Yes, and the changes required are small. In the ordinary bogie truck it is necessary to have two holes in the roof closed by suitable doors, and in each end there will be one or two doors also closed; the loading will be from the top. When it gets

to the port elevator or to the large up-country elevator the usual practice is to break up the train and divide it into a certain number of parts; in Cape Town it is divided into four parts and each wagon passes on to a portion of the truck which can be hoisted and the doors are open and it is immediately conveyed to the elevator. I have not made a close estimate of what these changes would cost for the ordinary type of Indian rolling stock. We have sent to our firm all the particulars of the Indian rolling stock used on the North Western Railway. But I have estimated it roughly at Rs.500.

40,507. Is much grain carried in open wagons to-day in India?—Very little.

40,508. Would the risk of petty theft and pilfering offer any special problems in India?—I do not think so.

40,509. Is pilfering very heavy?—Yes, particularly when the bags are lying in the railway stations.

40,510. The bags can be pilfered?—Yes; they are pierced and the grain comes trickling out.

40,511. It is only when the bags are left at the station that the leakage occurs?—Particularly so; it will not be the case with covered wagons.

40,512. There is no pilferage on closed wagons?—Not to-day.

40,513. In other words, the system of doors and locks is satisfactory?—Yes.

(The witnesses withdrew.)

The Commission then adjourned till 10 *a.m. on Saturday, the* 19*th February*, 1927.

APPENDIX I.

EXTRACT OF REPORT ON GRAIN ELEVATORS, BY THE GENERAL MANAGER OF RAILWAYS AND HARBOURS, UNION OF SOUTH AFRICA, FOR THE YEAR ENDING 31ST MARCH, 1925.

The Capetown port elevator, with a storage capacity of 30,000 tons, and 33 country elevators in the maize areas, with a total storage capacity of 106,600 tons, were opened for normal working in August, 1924.

The total quantity of maize and kaffir corn handled in the elevator system for the grain season ended 30th June, 1925, was 80,000 tons, equivalent to 800,000 bags. The reason for this comparatively small tonnage was the poor maize crop as the result of severe drought.

Of the total tonnage handled in the system, 45,933 tons were exported through the Captown elevator, the remainder being disposed of for local consumption.

European youths are being employed at the elevators, and it is satisfactory to record that the experiment, affording as it does a new avenue of employment in the country districts where elevators are located, has met with a considerable measure of success.

The youths are enthusiastic and eager to adapt themselves to elevator work with a view to qualifying for the more responsible posts. Some of them have attained a high state of efficiency, and have been promoted to positions either as first or second assistant operators.

At the time of writing, the 1924-25 maize crop, which is a record one, approximating 25,000,000 bags, is being dealt with in the elevator system.

Although the season's operations commenced about six weeks later than usual in consequence of late rains, it is possible to mention a few points of general interest in connection with the working of the elevator system under high pressure.

With the record production of maize throughout the whole of the maize belt in the Orange Free State and Transvaal, there were early indications that the elevators would be extensively used and that the system would be

inadequate to cope satisfactorily with the enormous volume of grain offering this season.

All that could be done, therefore, was to meet the position with a determined effort to ensure the maximum tonnage of grain being handled through the system consistent with the handling and storage capacity available.

The most important addition to the system was the provision of temporary facilities at Maydon Wharf (Durban) for shipping of bulk grain. Photographs of the facilities provided are reproduced in the pictorial section of this report.

The following figures show the tonnage of maize handled through the elevator system for the period 1st July, 1925, to 3rd October, 1925:—

	Tons.
Total maize shipped through Capetown port elevator ...	125,976
Total maize shipped through Maydon Wharf	70,007
Total shipments	195,983
Total delivered for local consumption	1,774
Total in elevator system on 3rd October, 1925	141,562
Total tonnage handled	339,319

In reviewing the foregoing figures, it should be noted that, due to the lateness of the season, only 55,000 tons has been received into the system up to the 31st July, and at that date only 4,000 tons had been shipped or delivered out of the system, so that the great bulk of the tonnage handled was dealt with in two months.

Bearing in mind that the total capacity of the 33 country elevators in the maize areas is 106,600 tons, the handling of 284,319 tons in two months represents over two and a-half turnovers for the country system, or equal to 1,421,590 bags per month, which is regarded as highly satisfactory.

In all probability the season's operations will extend to about February or March, 1926, as there still remains an enormous quantity of grain to be handled for export.

It is interesting to note that the average market price of grain in bags varies from about 3d. to 6d. per bag only in advance of the price of grain in bulk or ex elevators, which, of course, means that at present-day high prices of bags the producer only receives a small fraction of the cost thereof when selling his grain in bags.

The experience gained thus far during this season clearly indicates the need for extending the elevator system to meet the expanding maize industry of the country, and consideration is being given to the question of constructing more country elevators. In the meantime, provision has been made for the erection of one small experimental elevator of new design, and it is expected that the construction work will be commenced at an early date.

The national advantages of elevators continue to receive prominence in Australia, and in this connection it is interesting to note that, following the lead given by other States, the Parliamentary Board appointed recently by the Victorian Government to inquire into the handling of grain in bulk has recommended the construction of elevators at 132 country railway stations and two terminal elevators. The cost contemplated is £3,512,000. These elevators, it is proposed, will have a total storage capacity of 17,445,000 bushels and be capable of handling a wheat crop of 40,000,000 bushels.*

* 33 elevators = 106,000 tons.
132 ,, = 17,445,000 bushels = 469,300 tons.

Messrs. R. E. Grant Govan and S. A. Bunting.

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APPENDIX II.

GRADING OF THE WHEAT CROP IN THE N.W.R. AREA, BY MR. J. H. GILLETT, OF MESSRS. HENRY SIMON, LTD., MANCHESTER.

Classification of the crop.—The quality of the wheat produced in this area varies very considerably. Whilst it is difficult to define closely the areas producing different varieties, the following general survey may be useful.

The area may be divided into six districts as follows:—

1. The district which centres on Lyallpur, and includes the following places within its boundary:—Multan City, Jhang City, Sargodha, Chuharkana, Pattoki and north of the Sutlej to Multan.

The wheat produced in this area is of good quality and is higher priced than any other except that produced in district no. 3.

2. The district which centres on Amritsar, and includes the following within its boundary:—Lahore, Gurdaspur, Mukarian, Karika Khanna, Malerkotla, Faridkot, Guru Harsahai, Rachanwala.

The wheat produced in this district is of poorer quality, somewhat soft and thick skinned.

3. The district south of the Sutlej, including the following places:—Bahawalnagar, MacLeod Ganj Road, Abohar, Kot Kapura, Tapa and Bhatinda.

Very good quality—hard dry and expensive.

4. The district around Jakhal, Narwana, Jind and Hissar.

Poorer quality wheats—soft and thick skinned.

5. The district around Amballa, Kurukshetra, Panipat and Delhi.

This district produces a somewhat soft wheat, but of good milling quality.

6. The district around Saharanpur, Muzaffanagar and Meerut.

The wheat grown in this district is soft and of poor milling quality.

The differences between the different classes of wheats are great enough to rule out the possibility of having one standard Punjab wheat with grades according to cleanliness, etc. The miller who orders Lyallpur wheat will not be satisfied with wheat from Amritsar, though at present there is a considerable quantity of wheat railed to Lyallpur for sale there as Lyallpur wheat. This, however, is generally mixed with a large proportion of the local wheat before selling.

Number of grades.—The number of grades of each class of wheat required would be three or four. Most of the American winter wheats are kept within three grades, though there are six grades of the spring wheat and various special grades, e.g., No. 6 Frosted, etc.

As, however, the chief defects of the Indian wheats are weevil, dirt and barley, it is felt that with the almost complete elimination of the weevil trouble three grades would be sufficient.

For export the wheat could be sold under the same classes and grades as those used for internal consumption. This would have the advantage of putting a premium on the better wheats and so raising the general quality. It would be found that the European millers and merchants would be very quick to recognise the better qualities.

Fixing of grades.—The actual allowable percentage of barley, dirt, small seeds, shrivelled and immature grains, etc., in the various grades could be fixed after tests have been made. A very considerable amount of data is already available on this subject, owing to the practice in many of the flour mills of analysing each sample of wheat on receipt. The method in use in America would serve as a useful guide, but it has the disadvantage that

it is possible to produce No. 1 grade wheat by mixing two or more samples of No. 2, in other words, by bringing each impurity up to the allowable limit. This, of course, could be avoided by fixing a limit for the total amount of foreign matter in each grade in addition to the individual limits for each impurity.

The difficulty with the weevilled grains will very largely disappear when the elevator system is capable of absorbing the whole of the crop within about two months of harvest. The infection takes place in the *banias's* and other godowns, and from the use of old and dirty bags. Whilst it would be an advantage for the wheat to be delivered to the elevator immediately after harvest, and so avoid the possibility of infection, it is noticeable that little damage is done during the first two months. Once in the care of the elevator, the small exposed surface and the cleaning machines available will keep the weevil in check. For samples which are badly infected more drastic methods than the above are available.

Curves based on hundreds of analyses made at one of the larger flour mills confirm that the wheat received during the two months after harvest are comparatively free from weevilled grains, but that after this period the increase is steady until the end of the wheat year.

It will probably be found advisable to have three grades of weevil-free wheat, and to penalise the weevilled grain by placing it in a special grade.

Grading procedure.—The method generally adopted is for the wheat grader, who is on the staff of the elevator, to grade the wheat after the preliminary cleaning. With the rougher impurities removed, it is easier to grade the wheat correctly. This procedure, however, would necessitate running each parcel into a small bin, after cleaning, to enable it to be run into the correct bin when the grade has been fixed. Some difficulty also might arise through a disinclination of the owner of the grain to part with it until he knew into which grade it had been classified. He has the right of appeal to a central authority, whose decision is final, though he is penalised if the decision goes against him.

Small mechanical sample analysers can be obtained, though a good experienced grader can give more information from a careful inspection of the grain than can be represented numerically by the results obtained from the machine.

Experience in other countries has shown that few appeals are made, and for satisfactory working of the elevator system disputes must be avoided as far as possible. If arrangements were made for separate bins for each parcel, the delay would not be so serious, but the enormous number of bins required for this would make the elevator very expensive and would considerably complicate the running of it.

The whole scheme of grading must be simple and clearly defined, and, with the experience of many men who are closely associated with the grain trade available, it will not be difficult to arrive at suitable definitions.

Messrs. R. E. Grant Govan and S. A. Bunting.

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Tuesday, February 22nd, 1927.

DELHI.

PRESENT:

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S. (*Chairman*).

Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. J. A. MADAN, I.C.S. } (*Joint Secretaries.*)
Mr. F. W. H. SMITH. }

Mr. F. L. BRAYNE, M.C., I.C.S., Deputy Commissioner, Gurgaon.

Replies to the Questionnaire.

INTRODUCTORY: There are two great things to be done.

(1) First I would insist with all my power that no improvement of agriculture is of any use whatever without uplift. An uplift campaign must precede and accompany all efforts at improvement of agriculture. Improvements in agriculture cannot precede an improvement in the standard of living and no improvement in the standard of living is possible without breaking the hard brake of custom which grips the rural area. The people do not know how to spend the money they have got, so what is the use of giving them more money till they have learnt this lesson? They live in the most unnecessary squalor, misery, suffering, degradation and disease. The improvement of agriculture matters nothing compared with the importance of teaching them to live healthy, reasonable human lives. I attach the outlines of the propaganda campaign which is being carried on in Gurgaon, to achieve this end, and also a paper written by me which was read at the Educational Conference held in December, 1926, at Lahore.*

(2) The second great thing is that it is utterly useless and worse than useless introducing better machinery, better seeds and better farming until we can stop the people ruining their land and impoverishing and degrading themselves by the making and burning of dung cakes. If the Royal Commission will stop the making of dung cakes, they will double the crops in India and make all other agricultural development easy.

These two things are the first and the greatest essentials in India. If I might pick out the heart and centre of the uplift campaign, I should say that it was the elevation of women. India is the most backward of all countries because it regards women as hardly human. If it gave her proper place to women, India would very soon gain its own proper position among the nations of the world. Until it does so, India is bound to be backward and degraded and to be counted among the less honoured countries of the world.

It must not for a moment be supposed that I would stop the women working in the fields. Far from it I consider the fact that the women (of all but the unfortunate *purdah* observing castes) work in the fields

* Not printed.

and every infant for the first year of its life lies in a basket under a tree in the fields, as the one redeeming feature of village life and the one thing that keeps the people healthy.

I want to stop the unnecessary and unhealthy work of corn grinding and dung cake making which wastes time far better devoted to the welfare of the children.

The other things are details. We all know that there are whole big branches of agriculture entirely neglected by our Agricultural Departments, that our system of education is largely wrong, and that our propaganda arrangements are childishly inadequate. These we can put right ourselves, but it requires something in the nature of an upheaval to stop the making of dung cakes and to initiate an uplift campaign with its centre as the elevation of woman.

Very little is possible with the administration constituted as it now is. In the first place, for the last six years, the Punjab Government has for better or for worse surrendered many of its responsibilities to its Finance Department, whose duty is to view with suspicion all new ideas presumably because it cannot see an immediate return on the outlay demanded. Consequently it is almost sheer waste of time working out uplift schemes.

Secondly, Government is so entangled and obsessed with paper work, that the percentage of Gazetted Officers able to visit the villages themselves and gain any first-hand knowledge and experience of actual rural conditions is infinitesimally small, while Government is so centralised that the few officers with actual fresh rural experience have a very small chance of ever being able to get a proper hearing. All this may be theoretically incorrect but it is, as far as district practice goes, painfully true. The result of the present methods of administration in the districts themselves is that the people and the officials are absolutely convinced that Government's heart is not in the uplift business at all. Local schemes are turned down with monotonous regularity. I am told that a departmental officer with headquarters at Lahore can often get money by going round and reasoning with the Finance Department but, of course, that is not the way to run a big country. Government is very much out of touch with local needs and local conditions.

To show the immense difficulties in the way of rural uplift and development I may give the case of Gurgaon district. For six years I have been struggling by every means in my power, by official, demi-official and private correspondence, by interviews, with officials and Ministers, by the front door and by the back door, by the good offices of Members of Council and with the help of the press, and I may say that as far as getting official recognition of the necessity for developing the district and for getting Government help for uplifting the people is concerned, I have cut extremely little ice in return for many years of overwork.

I sent up a development scheme in 1922 and again in 1926 and yet again in 1926; I asked for instructions to submit a scheme for a part of the district rapidly becoming depopulated from continued neglect. The first and the last Government refused to contemplate and the second has. I believe, been pigeon-holed.

Six years is an exceptional period for any official to stay in a district and if so little can be done with Government in six years, you can imagine how little those with local knowledge can ever hope to effect.

Side by side with my campaign for official help, I have organised an intensive propaganda campaign among the people themselves with surprising success, so much so that the people are now awake and simply waiting to be shown the way. Things which would have been impossible a year or two ago are now coming to pass with hardly a struggle.

Mr. F. L. Brayne.

Things have developed so surprisingly fast that if we had money to engage staff and carry on our propaganda properly we could revolutionise the whole village life of the district. Owing, however, to the impossibility of getting adequate official help, I am overworked in doing the work that other people should be doing, and unable to supervise and push on the campaign while the campaign itself is only being done on a microscopic scale for want of workers.

In its search for abstruse and expensive remedies for the present appalling state of rural affairs in India, Government may now be in danger of failing to see the big simple things lying at its feet.

Elaborate remedies are really not called for at the present stage. The first thing to do is to change the whole attitude of the administration and make it recognise that after the maintenance of peace, uplift is the main end of Government as far as the rural area is concerned. Agriculture is a branch of uplift but not by any means the most important. Improvements in agriculture are only needed to provide the necessary money and leisure to the people for self-improvement, while in many places the people have already ample money to live healthy comfortable lives if they only knew how to spend it.

The big things are to teach the people how to spend their money in making themselves healthy, happy and comfortable, teach them the rudiments of public health, hygiene and sanitation, and elevate the women to their proper position in human life.

The first few things to do then are:—

(*a*) to send the girls to school;
(*b*) stop the making of dung cakes;
(*c*) dig pits for the manure and village refuse and sweepings;
(*d*) open windows and ventilators in the houses;
(*e*) abolish the grinding of corn by female labour, and
(*f*) reinstate the menial castes in their proper position among mankind.

Add to this the teaching of the dignity of labour and you will make a paradise of the Punjab villages. Till these things are done, it is waste of time working at new kinds of seeds and implements and all the other niceties of advanced agriculture.

The Government authorities responsible for sanctioning or modifying local uplift schemes are rarely seen either in the villages or even at district headquarters.

If uplift is to be a real thing and the local workers are not to go on being disappointed and discouraged, there must be a real live organisation for the work. At present all schemes are criticised at provincial headquarters and in a hostile atmosphere, and there is little effort made to consider them on the spot where they were framed and where they are to be executed and where local information and experience is available.

An officer—call him Director of Rural Uplift or Director of Rural Development—is required, sufficiently active and junior to tour regularly at all times of the year in the districts themselves and sufficiently young to be keen and optimistic. Uplift is a matter of enthusiasm which is apt to die as the years pass and touch is lost with the actual villager.

Development may be divided into two kinds: (1) *Provincial*, including canals and railways and big schemes requiring a large outlay of capital, and (2) *Local*, including uplift (such as mentioned in the Gurgaon propaganda scheme, copy attached)* afforestation, bunds, wells, co-operation and other local schemes (such as are contained in the Gurgaon Development note, copy attached).†

This local development can only be carried out on the spot, and all these local schemes can only be properly examined in the districts for which they

* Not printed.
† Not printed.

are intended. At present they have to be sent to Lahore, where in an alien atmosphere they are considered on their "merits," and naturally they have few merits in the eyes of the overworked officials with little or no recent knowledge of the particular people, places and conditions they are intended to suit, and to whom those schemes are liable to be viewed as so many "hares," meaning extra work to all concerned.

The attitude of Government towards the proposals of local officers is not always that of sympathy and support. The work is all centralised, the central offices are overworked, local schemes increase work, and are, therefore, likely to be unpopular.

I have no doubt that the individual incumbents of the Secretariat offices are in full sympathy with the cause of rural development. The resistance to new ideas is entirely unconscious, the natural result of overwork, the complicated character of the machinery and the distance from the realities of rural life.

The Financial Commissioners are choked with work and cannot ever hope to be able to consider local schemes on the spot, and local officials cannot be always running up to Lahore to explain away misunderstandings. For this reason I insist on the creation of a Director of local uplift.

This Director must not be forced to justify the expenditure of every penny to a Finance Department; whose main duty is keeping down expenditure on everything that does not promise an immediate and adequate cash return; he must have his budget and be allowed to lay it out as he sees best in consultation with the local officers and with the people to be benefited.

The old system of administration has completely changed, and much of the progress achieved is done by departments unborn when the system was devised. In the old days the Deputy Commissioner was everything. He still is everything to the people, but to Government he is mainly a convenient beast of burden to be loaded with routine and drudgery. The Deputy Commissioner is, however, still the man best qualified to advise all departments and say how money can best be spent and to co-ordinate the work of all departments. He should be the constant adviser of the Government in all matters of rural uplift and development, and Government should look to him for its inspiration in rural matters, should invite and welcome any proposals and suggestions he may have to make. Any money to spare for development is now very largely given to departments which can work or refuse to work in districts more or less as they like, and the Deputy Commissioner is helpless without money and without sufficient power to induce these departments to do anything or to refrain from doing anything.

The Deputy Commissioner, if he wants anything done, has to address Government through the Commissioner, and this often leads to nothing, as it gets into channels that are already choked with work and unable to devote themselves to local uplift.

As far as district officers are concerned, a great obstacle to progress is the rapid transfers of the Deputy Commissioner's assistants, often with complete disregard of the Deputy Commissioner's wishes and the work in hand. As soon as the Deputy Commissioner has trained an assistant for his uplift campaign he may be immediately moved elsewhere, and the result is the Deputy Commissioner's work is continually being spoilt in a most disheartening manner.

The Deputy Commissioner must be the guide and leader of the local uplift campaign, but he is given entirely inadequate and inefficient staff, and is not expected to ask for either money or staff for the daily increasing work.

Another very great obstacle to uplift is the presence in the villages of an inferior and semi-slave race—the menial castes. Just as slavery ruined Rome, so the menial castes have ruined the Gurgaon peasant. The dignity of labour is gone, and all drudgery is relegated to the menial castes, as well all technical work requiring manual skill. The result is that the

peasant refuses to do his own chores, and his village is filthy, and he loses all the training of hand and eye he would have if he had to make and mend his own implements and do his own skilled labour. I do not say that every peasant should be a blacksmith and carpenter, but if one of four sons of a peasant became a smith and another a carpenter, a vast amount of manual skill would, generation by generation, be disseminated among the agricultural classes, to the immense benefit of their general intelligence and handiness.

The menial castes ought to be steadily drafted off to the canal colonies, given land and set to reinstate themselves in the world. Then and then only will the peasant become a sturdy self-reliant man again.

From my evidence it is clear that I require money to put things right in the Gurgaon District. The amount, however, is very small compared to what is already being spent in other directions, and the return is both certain and adequate. If Gurgaon district is developed in the manner I have indicated, even the cash return in the form of regular collections of the existing land revenue and enhancement at next settlement, would be at least 10 per cent. per annum of all the money laid out. To this must be added the enormous asset of a healthy, happy and contented population of 682,003.

QUESTION 1.—RESEARCH.—(*a*) (i) Research should be clearly divided into branches according to the problems being tackled. At present vast branches of agriculture are much neglected, such as:—

1. *Well and rain Crops.*—These go together, as well-farmers generally combine wells with rain crops. This branch includes:—

(*a*) Well crops.
(*b*) Rain crops.
(*c*) Well sinking.
(*d*) Water lifts from:—(1) wells.
(2) *jhiels*.
(3) rivers.
(*e*) Searching for sweet water in bitter areas.
(*f*) Increasing water-supply in existing sweet wells.
(*g*) Tube-wells.

2. *Pastures.*—These are almost entirely neglected at present, except for a very little work in (*e*) and (*f*). Largely as a result of the insistence of Gurgaon district a Pasture Officer has been appointed, but his staff and budget are so infinitesimal that his appointment is merely nominal.

(*a*) (ii). *Veterinary.*—1. Should undertake all research work on pasture and on fodder crops.

2. Must include much work for the increase of the milk supply of the Hissar cow, as this is a very grave flaw at present.

Once the Hissar cow can give a supply of milk fairly proportionate to its size, the Hissar breed will eliminate buffaloes and all other breeds in the Hariana area, and be a great source of profit to the area and provide cattle for a large area outside.

(*b*) (1). Work on pasture is purely nominal for want of staff and money.

(2) A Livestock Expert has been appointed, but this is even less than nominal, as the officer appointed has all his old duties to perform *plus* those of his assistant, in addition to the new office.

(*c*) (1). Little if anything is being done for the well-farmer or the rain-farmer, and huge crops like *bajra* and *jowar* are entirely neglected. Nothing is being done to teach less risky and cheaper methods of well sinking and the lifting of water from wells is neglected.

(2) Nothing is being done to break the habit of burning the dung of the cattle, and nothing is being done to teach the production and use of other fuels and discover grates suitable for them.

QUESTION 2.—AGRICULTURAL EDUCATION.—(i) No. There must be a *chahi* and *barani* Lyallpur Agricultural College in the South-East with a *nahri* section for the Jumna and Agra canals. Every civil division must have its own college. Lyallpur is so far off that not only cannot our students reach there, but conditions are so different that much of their teaching is valueless for our conditions.

In addition to this, agriculture must be taught in rural schools--high, middle and primary.

The method must be suited in each case to the kind of student and the kind of agriculture best suited to the area from which the school draws its pupils.

(ii) There is nothing for Gurgaon people corresponding to the Lyallpur College for the canal colonies. There is a very urgent need for a college in the South-East for the well and rain farmers, both for research and teaching.

For teaching school teachers and village guides in uplift and elementary agriculture, the School of Rural Economy, and for teaching women uplift and domestic work the School of Domestic Economy have been founded at Gurgaon. They require adequate financing and being put on a permanent basis. Similar schools are required in every district as the conditions of every district differ and the schools will always have a full quota of pupils from the district without taking in outsiders.

(iii) Most certainly. The non-agricultural teacher generally cuts no ice with the agriculturist.

(v) To get a living as a Babu.

(vii) No menial and casual labour should be allowed. At present a partially useless class of man is being turned out, who dislikes putting his hand to anything, who often cannot drive bullocks or plough and who is despised and laughed at by the villagers. The dignity of labour is the first and greatest lesson to be taught in the agricultural schools and colleges.

(viii) All are excellent.

(ix) Clerical. Even those appointed as Agricultural Assistants want to be imitation professors and not hard-handed practical demonstrators.

(x) By combining it with general rural uplift and by making it both practical and scientific so that the pupil becomes rapidly convinced that he personally by using his brain as well as his hands can really grow better things than the farmers.

(xii) By making uplift the medium of instruction so that the pupil becomes rapidly convinced that he really can better conditions at home.

(xiii) The well and rain farming college which is to be the counterpart of Lyallpur in the South-East Punjab must be provincial. The Schools of Rural and Domestic Economy which should be established in every district on the lines of Gurgaon might best be District Board's with sufficient help from Government to make them properly efficient.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) Demonstrations from village to village at central places and on farms, &c. Other measures like the following may be adopted: Competitions and championships, shows, leaflets and posters, weekly district gazettes, lantern lectures, songs and singing parties, wandering minstrels, theatrical performances, school teaching, prizes, rewards and honours.

(*b*) Demonstrators must be themselves able to handle cattle, plough, &c., at least as well as the ordinary farmer.

(*c*) See (*a*) and (*b*). Every *tehsil* should have its farm; intensive propaganda must go on in every village.

A great obstacle to the acceptance of expert advice is that Government often fails to practise what it preaches. It advises protecting wells against cholera but allows its own wells to be unprotected. It advises the use of

iron ploughs, Persian wheels, &c., while allowing wooden ploughs and prehistoric water lifts in its own gardens.

If Government spoke with one voice in all its departments the people would have a clear lead.

(*d*) Intensive propaganda first for agriculture and cattle breeding and later for uplift generally, including public health, has been going on in Gurgaon for six years with marvellous results.

It is difficult to give particulars of the success of our propaganda as so much of the results are intangible, consisting of the entirely changed outlook and mental attitude of the whole rural population, a willingness to listen and discuss, and often to follow our advice, a general desire for education and uplift. The schools are over-crowded with boys, the girls are coming in hundreds, the men flock to the night schools, the people have founded two high schools with their own money and a third is being started, while one of them they tax themselves heavily to maintain. Our magic lantern lectures are crowded with eager listeners both men and women. Our leaflets and posters and propaganda literature are greedily absorbed, and our Boy Scouts Association is supported all over the district, and we have hundreds of scouts; our Health Association has members all over the district and village centres are steadily being opened; our Health tours are packed with women eagerly showing their babies and asking for advice, our Health Weeks every year show a rapidly increasing attention being paid to the children; hundreds of villages have dug pits six feet deep for the manure and sweepings and have tidied up their villages, practically every village has removed its heaps of rubbish to the fields; there are signs of the dung-cake habit being broken here and there, and one village has started growing flowers. Over 1,600 iron ploughs are working and many hundreds more are on order. Our ploughmen are now famous all over the Punjab. Nearly 1,000 Persian wheels have been put up and the demand has far outrun the supply. The demand for improved wheat seed, cotton seed and *bajra* seed is always greater than the supply; there is a great demand for grass seed and tree seed, large areas of hill-land are being closed to grazing and afforested, there are over 600 Hissar bulls in the district and there is an annual demand for more than double the number of bulls that Hissar can provide; Hissar heifers are being sold in the district, the habit of loosing bad bulls is dying out and the castration of inferior stud bulls is proceeding without any hitch; there are over 850 co-operative societies with nearly 25 lakhs of capital. Six years ago there were no bulls and only 150 banks and a lakh or two of capital. So keen are the people on horse breeding that we have had to double the number of stallions and the Remount Department have found it worth while to establish themselves in the district.

The hospitals are crowded and there is a great demand for new ones, which are being opened as fast as money can be found. Vaccination returns show great increases every year and the people are so changed that a campaign for re-vaccination is a complete success. Plague has almost ceased to be a serious danger. so willing are the people becoming to inoculate themselves and have the rats killed. In the last six years 3,000,000 plague inoculations have been effected.

A good sign is the way money can now be raised for all kinds of uplift work, while six years ago it was almost impossible even to get prizes for a district athletic tournament. One community has framed social rules and to a great extent acted on them for several years. All communities are beginning to make better-living co-operative societies. A magnificent hall is being erected at Gurgaon by public subscription as the centre of all our many activities. The method is hard work and continuous personal effort by myself and all my assistants. and continuous pressure in season and out of season. Every week new forms of propaganda are devised and new

methods of driving home the lesson. Everything is taken into the villages themselves and everything is fully discussed every month at the meetings of the District Board and Rural Community Council. None is asked to do anything until I or my assistants can convince him that it is the right thing to do and every argument and objection is heard and met.

QUESTION 4.—ADMINISTRATION. (c) (1) Agricultural and Veterinary. Agricultural Services are *microscopic* at present The Punjab Agricultural Department is hardly a provincial agricultural department at all. It might best be described as a "Canal Colonies Wheat and Cotton Improvement Department" with side lines in other things. It grudges much expenditure outside the canal colonies and even after years of continuous effort only a little work is being done in the Gurgaon district, and even that they say is in excess of what is done in most other districts.

Well cultivation, rain cultivation and pasture are practically untouched, except for a little well-boring on a minute scale, and for some reason even that is made unpopular by a scale of overhead charges, which convince the people that Government is not really out to develop the country.

Veterinary.—On far too small a scale for a district like Gurgaon with the biggest cattle-breeding system in India.

The Veterinary officers themselves are alive to the danger of not providing adequate staff but the Department they work in and the Government are troubled with the theory that all districts must be treated (or perhaps ill-treated) alike. This applies particularly to out-of-the-way places like Gurgaon; the central districts have crores of capital sunk in them for irrigation and other development work, but when Gurgaon asks for a few thousands or a few lakhs for what development it is capable of, it is liable to be met with the argument that it can only have its share, and this when some districts have had sufficient capital sunk in them to provide a million acres of canal irrigated crops and Gurgaon has only 40, 000 acres, while for every penny of well crops the capital is only lent and has to be repaid with interest, and for well-boring a bill for overhead charges is presented.

(iv) A vast amount of propaganda could be done by loud speakers provided a programme suited for the agriculture and uplift of each locality was devised and no attempt was made to provincialise the programme.

QUESTION 5.—FINANCE.—(*a*) Co-operative banking must be developed for the financing of agriculture; Central and Union Banks must be allowed accounts at the Treasuries and Sub-Treasuries and every payment to Government must be allowed to be paid through these banks. This will lead to a vast increase in banking and thrift.

At present the Punjab Government is apparently unable even to ask for such a facility, which is a luminous commentary on the way the dice are still loaded against rural uplift.

(*b*) *Taccavi* should be freely poured into the co-operative Central Banks, Unions and village societies to finance agriculture in times of need, that is to say, whenever the Registrar is satisfied that it should be lent, and to finance development.

We must not allow *taccavi* to spoil the efforts of banks to attract local capital, but this must be attended to by the Registrar, and when he asks for it, Government must consider that the money is really required. If Government thinks its Registrar is spoiling the movement it must remove the Registrar, but till then it must give what he asks. It must be beyond the power of a Collector or Commissioner to refuse help.

Taccavi should be used to develop districts and make them secure from famine. At present, the richest districts get *taccavi* at the same rate as the poorest. The poor, insecure, backward and undeveloped districts should get *taccavi* free of interest and at reduced rates of interest for the development of crops irrigated by wells, bunds, &c., and for all kinds of develop-

ment work such as afforestation, stock-breeding (cattle, horses, sheep, poultry, &c.), and for the improvement of public health and prevention of epidemics, drinking water arrangements.

The criterion should be the poverty and insecurity of the locality and its need for development.

For instance, in the Central Punjab every village has its flour mill. Gurgaon has practically none and five years ago had absolutely none. Bunds are necessary in Gurgaon but in very few other districts.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) The insecurity of the Gurgaon District and its backward and undeveloped state are the main causes of indebtedness.

(*b*) To relieve this a properly concerted scheme of development is required. This was proposed in 1922, but Government refused to contemplate it. It was submitted again early in 1926, but nothing has been heard of it for many months. A further attempt was made in 1926 to obtain permission to frame and submit a development scheme for the *Kadir*—now rapidly being depopulated from the neglect of ages—but Government would have none of it.

Along with a scheme of development must come measures for dealing with existing debt as it is unlikely that the people in the worst parts of the district will ever re-instate themselves, they are so badly steeped now.

A usury act whereby all payments of interest above a certain rate are automatically deducted from the loan capital would help, and a special form of agricultural insolvency (*see note attached*) might help, but both these must be worked in close co-operation with the Co-operative Department or the last state of the zamindar will be worse than the first.

(*c*) All mortgages both to agriculturists and non-agriculturists should terminate automatically without further payment after a term of years which should be reasonably short, *e.g.*, ten years' maximum. This will reduce the zamindar's credit to a reasonable limit. Existing mortgages without limits of time should run for the full period from the passing of the Act and then automatically terminate.

Note on suggested legislation for depressed agriculturists.
A mixture of Court of Wards and Insolvency.

A zamindar or his creditor may apply to the Collector for a settlement of his accounts. The Collector shall invite the creditors to select one representative of creditors, the zamindar one, the Co-operative Bank Department one, and shall appoint a fourth to preside (usually a revenue officer).

Notice shall be given to all creditors and affixed in the zamindar's village and at the *tehsil*.

The zamindar's land and all assets liable to attachment under the law shall be vested in the Co-operative Department for a period of not more than ten or fifteen years.

The Co-operative Department shall settle with the creditors and manage the estate in such a manner as it may see fit for the benefit of the debtor and the recoupment of the money paid in settlement of his debts, provided that the debtor shall be allowed to cultivate the whole or part if he wishes. subject to his farming in the manner laid down by the Co-operative Department.

If the Co-operative Department will not take up the land then the lease of the land for, say, ten years shall be auctioned for a lump sum in cash.

After his application has been accepted by the Collector, no suit shall lie for any debt against the man whether the debt was incurred before, during or after the settlement and all pending suits shall be referred to the Collector for decision with the other debts, and after his land is released from the co-operative society no suit shall lie for any debt incurred previous to his release.

The amount to be paid in full settlement shall be the amount that can be fairly paid on his existing assets and his land within reasonable time (say, ten or fifteen years), regard being had to the amount of his debt which consists of interest and compound interest only.

If the zamindar conceals his assets or acts in any way dishonestly, the Collector may at his discretion close the enquiry.

If any creditor refuses the composition proposed, he shall be immediately paid his *pro rata* share of any assets which are liable under the existing law to be seized for debt, and his claim shall be considered as settled in full.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) Consolidation should be undertaken by the Collector on the application in writing of the owners of a majority of the cultivated land in the village (as recorded in the latest *jamabandi*). He should have a special assistant to protect on his behalf the rights of minors, widows, &c., a sort of public trustee who would represent all the classes in (*c*).

There should be no appeal to a court except as for mutations.

A little injustice may possibly be done, but the gain to the community will be too vast to allow this to stand in our way any more than the possibility of having to acquire a widow or a minor's land will prevent us projecting a railway or a canal.

QUESTION 8.—IRRIGATION.—Gurgaon is a district where no extension of canal irrigation is possible.

Capital must, therefore, be freely sunk by Government in:—

(*a*) Bunds,

(*b*) Tube-wells.

(*c*) Ordinary wells.

Bunds will not only provide irrigation but will raise the level of the subsoil water in the wells, prevent erosion and sand deposits, and protect a large area of crops above and below the bund by the moisture retained in the soil.

They have been proved to be of the greatest value in the Gurgaon district, although they do not show a big financial return as many of their benefits cannot be measured in terms of water rate.

The capital sunk should take the form of Government projects for (*a*) and (*b*), grant-in-aid and *taccavi* without interest or at reduced interest for (*a*), (*b*) and (*c*).

Taccavi should be freely remitted for schemes that although properly carried out with the advice of Government are not as successful as they should be.

Little progress has as yet been made in securing the crops of Gurgaon district owing to the unwillingness of Government to give a lead and risk a little capital; no one will touch tube wells, or water lifting schemes till Government gives a lead.

No new bund has been built for many years now.

QUESTION 9.—SOILS.—(*a*) The one great thing required to improve all soils is to stop the pernicious custom of burning the cattle dung.

A start has been made in Gurgaon with propaganda for this purpose, and the experience so far gained proves conclusively that a big push by Government would break the custom in five years.

(*c*) For Gurgaon district pasture schemes are required by which remission of land revenue is given for pastures properly established and maintained and bounties are given for properly bred and kept stock, and for properly maintained reserves of fodder in the shape of ricks and silos. This should be done by the Co-operative Department working with the Live-Stock Department.

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QUESTION 10.—FERTILISERS.—(*a*) Until the making of dung cakes is stopped, it is little use talking about improving agriculture, and a very strong lead must be given in this direction.

(*d*) Gurgaon District. Owing to the intensive campaign the pitting of all the village rubbish sweepings has taken effect and the existing heaps have been cleared out, the land has had more manure than ever before.

(*f*) Propaganda, demonstration and example.—Government must plant trees on all its farms as an example, it must offer temporary remission for the growing of trees combined with the abandonment of dung-cake making, it must insist on all those over whom it has any sort of influence or authority setting an example, it must do everything possible in season and out of season, put it at the top of its agricultural programme and preach it by lectures and magic lanterns, offer prizes and do everything possible to break the custom. It must insist on all agricultural staff putting their backs into this work and making regular reports of the progress they make. At present Government is doing absolutely nothing to stop this suicidal custom; and has not even devised grates for the burning of the various alternative fuels suggested.

Taccavi, land revenue suspension and remission, and all other favours and assistance should be steadily refused to all villages or individuals which do not abandon the making of dung-cakes.

Government should forbid the making or storing of dung-cakes on any land or buildings of which it is the lessee or owner. If Government set its face against dung-cakes with all the power at its command, it could stop the custom in five years without any legislation and with no hardship to anyone.

QUESTION 11.—CROPS. (*a*) (i) With the exception of wheat and cotton and cane, Government has practically nothing to suggest for Gurgaon. Gurgaon's staple crops are gram, *bajra* and *jowar*, and Government has no gram tested for Gurgaon and knows little or nothing of the other two, although every year for many years now the district has clamoured for *bajra* seed. There is very good *bajra* seed to be had from Australia and good *jowar* is also known, but Government has not yet started work in these crops.

(ii) This should presumably be done, but there is such a vast field awaiting attention in the improvement of the existing crops that it seems superfluous to direct attention to new crops till the old ones have been properly dealt with.

(iii) Every *tehsil* should have at least one seed godown and other distributing centres should be developed as soon as the *tehsil* godowns are ready. At present insufficient effort is made to sell seed, and the local indents are generally only supplied in part. The sale is made more difficult by the absence of godowns which everyone knows and where those interested can make enquiries and the absence of all advertising, whether by local newspaper such as the District Gazette or by posters and pamphlets.

(iv) The introduction of quick fences will do most of what is needed, but this must be preceded by:—

(1) consolidation of holdings,

(2) research into the best kind of quick fence and the best way to grow it on each kind of soil in each district. Many districts have splendid indigenous thorn bushes and thorn trees and all that is needed is to learn the quickest and best way of growing them as fences.

The damage done by the larger wild animals is far easier to deal with and infinitely less harmful than that done by rats and insects. There is no point in making a campaign against the larger fauna while the smaller and infinitely more harmful pests are allowed the freedom of the fields.

The only real cure for rats is the Cyanogas dust-pump now being successfully used in Gurgaon district.

(c) With the introduction of Persian wheels by the Gurgaon District Board, the Board is introducing expensive crops on the wells, in place of wheat and barley with very great success indeed. It should be the determined policy of Government to break the custom of growing wheat and barley on wells and substitute the very many far more valuable crops which can be so successfully grown with this form of irrigation. Potatoes, cane, pepper, *lassan*, *zira*, cotton, vegetables, fruit trees and melons are some of the crops which should be developed in place of grain on well-land.

QUESTION 13.—CROP PROTECTION INTERNAL AND EXTERNAL.—(1) There are no measures in existence in the Gurgaon District. The District Board does what it can, but it is insolvent, and only the minimum of assistance is forthcoming from Government. Our chief pests are:—

1. *The yellow tail moth*, which only requires a little money for the necessary organisation to stop it, but we cannot get the money.
2. *Monkeys*, which the agriculturist Hindus would gladly see destroyed, but the non-agriculturists object.
3. *Rats*, for which the remedy is the Cyanogas dust pump. We are killing them in many villages and realising the cost from the villages. Things would be far easier if this could be legalised, but the Government has already refused to allow the Gurgaon District Board to improve conditions by financial self-help, so it is no use courting a second refusal, as this would interfere with our present unofficial method of dealing with this pest.
4. *A kind of grass-hopper*, which ruins the monsoon fodder crops and hay and for which no satisfactory cure has been told us.

A lot could be done if the District Board could be enabled by legislation to deal with pests and realise the cost from those benefited, but we dare not ask for this.

QUESTION 14.—IMPLEMENTS.—(a) Very substantial rewards should be offered annually for efficient implements of all kinds, and guarantees given to competing firms of the purchase of a certain number of these implements passed as efficient.

(b) Nothing can be achieved without propaganda. Competitions where feasible and demonstrations from village to village, all kinds of propaganda and the insistence by Government that nothing but up-to-date implements and machinery should be used for all operations of an agricultural nature carried out by any Government departments. There should be a vastly increased number of shows and exhibitions, and no district should miss its annual show, and even *tehsils* should have shows. These last are being organised by the District Board in Gurgaon district.

(c) The manufacturers' principal difficulty is their own timidity and lack of enterprise. They refuse to go into the villages to discover their needs and seek to supply them, and when they have a good article they refuse to go into the villages in order to popularise it and sell it. They refuse to establish agencies in country towns and expect local bodies or local officers to do all their work for them.

QUESTION 15.—VETERINARY.—(a) No. The stock breeding department should be separate under its own director. It gains nothing from being under the Department of Agriculture and stands to lose a great deal.

Stock breeding is a vast business and of vast importance, and must no longer be a side show of another department.

(b) (i) Yes. Yes.

(ii) No, by no means. The Gurgaon District Board has over 600 stud bulls, and its veterinary staff is utterly insufficient to inspect them and their produce, protect them from epidemics and run veterinary dispensaries as well.

Every dispensary should have two Veterinary Surgeons, one touring and one running the dispensary alternately, and the number of dispensaries must be very largely increased. Gurgaon district marches with Indian States for

150 miles of its border where nothing is done to cope with epidemics, so that much extra protection is needed in Gurgaon, let alone the vast cattle-breeding operations going on.

(iii) The present system is working very well except that the department is terribly cramped by being subordinated to the Department of Agriculture.

(c) Fair use is made, but the increase in the number of Veterinary Surgeons and dispensaries will have the result of making the people utilise them much more. At present they are too scarce and too far apart to be really appreciated.

(d) and (f) Ignorance and so-called religious scruples. Legislation is hardly needed yet, considering that the Government is unwilling to make even human vaccination compulsory in the villages, and is altogether opposed to any sort of pressure being put on people to save their lives from plague by inoculation.

Everything needed for the present can be done by propaganda; Gurgaon is a very good instance of the immense success that attends propaganda. The only check to propaganda in Gurgaon is the absence of money.

If legislation is utilised, I would suggest giving the village panchayat authority to make inoculation compulsory within the limits of its jurisdiction.

QUESTION 16.—ANIMAL HUSBANDRY.—(a) (1) The natural breeding grounds of first-class stock should be developed as breeding grounds, i.e., the Dhanni and the Hariana areas. Gurgaon has gone in for cattle breeding on a very big scale, but is terribly handicapped by the absence of any policy on the part of Government.

In order to buy an adequate number of stud bulls every year the Gurgaon district asked leave to be allowed to tax itself. Government refused this presumably on grounds of policy—although it never explained what policy it was—but omitted to compensate Gurgaon for the loss of the money it had to sacrifice to Punjab policy.

Gurgaon calculated that it would want 350 bulls a year in future to replace permanently all local-bred stuff. It warned Government years ago, but no apparent heed was paid to the warning, and now if Hissar devoted the whole of its produce to Gurgaon it probably could not provide enough.

Meanwhile, instead of concentrating the whole of the Hissar stock in the Hariana tract, Government has reduced the Gurgaon indent by 50 per cent. in order to enable Hissar to fritter away its bulls in twos and threes all over the Province. These bulls are being simply thrown away. Government does not even insist that the districts ordering in these microscopic quantities shall concentrate them in selected areas in the districts. These bulls go anywhere and are absolutely wasted from the point of view of improving the breed of cattle.

Meanwhile Gurgaon's indent has been halved and Gurgaon is the one district in India with a sound cattle-breeding policy being resolutely carried out.

Hissar should be developed to turn out the maximum number possible, and not a bull or heifer should leave the Hariana tract until it is saturated with Hissar stock.

These bulls and heifers should be issued at reduced rates according to the resources of the local bodies and zamindars. Cattle breeding should be encouraged by every way possible: remission of land revenue for pasture, premia for stud-bred cattle properly kept by co-operative societies, premia for fodder reserves in the shape of silos and stacks kept by the members, exhibitions and shows with big prizes. The Hariana tract is mostly poor, backward and undeveloped, and no better way of putting in Government capital by way of development could be devised.

Local cattle farms should be started by exchange of land with Nili Bar land. The Veterinary officers of the farms should inspect and help in the

breeding operations all round, and the area should become a selected breeding area, rather like a Remount area for horse breeding.

In this way a vast head of cattle could be raised for sale all over the Punjab and United Provinces, and all buyers of plough and milk stock and bulls would come to the Dhanni or Hariana tracts for them. The money thereby gained by these tracts would in some small way compensate them for the absence of canal water. Above all the milking capacity of the Dhanni and Hissar breeds should be developed by every means possible so that in time such wasteful breeds as Montgomery and buffaloes whose male stock is in the latter case a waste product and in the former a positive menace to the better breeds may be altogether eliminated. Any land available for cattle breeding grants in the Nili Bar should be capitalised and invested in a Central Bank, and the interest used for financing cattle-breeding societies in the Dhanni and Hariana tracts.

It is a terribly wasteful and unsatisfactory way of breeding cattle to give squares for cattle breeding; once given the square is gone, and it is as difficult to confiscate a square for unsatisfactory work as to get butter out of a dog's mouth.

Besides, this colony land is intensely valuable for other purposes; grazing is very difficult to secure, labour is dear, and everything is against cattle ranching. In the poor Hariana tract everything is in favour of cattle breeding, and a premium can quite easily be reduced or withheld for failure to comply with the conditions laid down. A little money will go a long way in these poor tracts, and for the annual value of one square ten or a dozen Hissar cows will be kept in ideal condition.

Cattle-breeding squares are sheer waste of money.

The scheme outlined above is being carried out in Gurgaon as far as funds allow, but Government has so far refused to contemplate remission of land revenue for pasture.

For six years intensive propaganda has been going on, the whole attitude of the people has changed, and there is no longer any resistance on religious grounds to the castration of bad bulls. On the contrary, the people now realise that a bad bull is a menace to the religion, as its produce can be of little use except for slaughter. As a result we have been able to eliminate the bad bulls and flood the district (as far as Hissar and Government allowed) with stud bulls. The result has been amazing. The quality of the stock is steadily improving, and from the experience gained we can say with certainty we are on the right lines, and it is only left now for the Royal Commission to obtain Government recognition and adequate financial support to the Gurgaon breeding scheme.

(ii) and (iii) are included in the scheme described in (i). All co-operative societies and the breeders should be as far as possible all organised in such societies, which will include milk registration and will be continually advised and inspected by animal experts.

(*b*) (i) and (ii) Parts of Gurgaon district are still packed with useless cattle, whose destruction is impossible on religious grounds.

The only way to meet this is by pasture and cattle-breeding societies and by the scheme above outlined, making the whole area into a cattle-breeding area with farms, veterinary surgeons and experts of all kinds. By intensive propaganda the people will soon join in, and cattle breeding will establish itself as a principal industry. Much has already been done; 600 bulls (and the increase of our stock of bulls is only limited by the limitations of Government policy) mean a very great change in the point of view of many thousands of cultivators.

Enclosed pastures will soon be formed with the attraction of remission of land revenue and premia, &c.

Once the breeding of cattle has gone so far that we can control the number of cattle of all kinds kept by the members of our societies, remission of land

revenue must be given for fodder crops and premia for fodder reserves such as silos, ricks, &c.

Something must also be done by legislation to enable a majority of owners in a village to recover the *shamilat* for the formation of a common pasture if it is being cultivated. If it has been divided up, then there must be a way of compelling everyone to hand back land pro rata for the formation of a new common pasture. There is plenty of land for everyone in most villages if it is properly farmed, even allowing for a big common pasture. The organised majority must also be able to ration the number of cattle to be kept on the common pasture.

Another difficulty in inducing landowners to take a keener practical interest in stock breeding is that there is hardly any expert at present to advise them on this subject. A Live-stock Expert has recently been appointed, but so far it is purely a paper appointment. He must not be expected to be also the Manager and Assistant Manager of the Hissar Farm; he must have adequate staff and funds and his whole time free for his job. The training of men must also be taken in hand at once so that they can inspect and advise and help in the districts. At present no one is being trained in live-stock work; how the Live-stock Department is going to function without trained men is a mystery. A training school must immediately be started.

(*c*) Some parts of Gurgaon district suffer annually from fodder famines in the winter and the two months before the rains, and often the whole district suffers so that the offer of premia for reserves is an essential part of any cattle breeding scheme.

Winter—December to February, and May, June, and July are our worst times.

(*d*) Land revenue remission and premia for fodder crops, reserves, &c., &c., as explained above.

(*e*) Rewards as explained above, propaganda, shows and competitions, and by making cattle breeding—as in England—an honourable hobby. The greatest in the land must be encouraged to keep their herds of pure bred cattle and there must be big shows and big prizes.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*a*) In Gurgaon district the zamindar has five months' hard work. If he has a share in a well he is busy for three more months. Otherwise he does little work for the rest of the year. In his slack time he smokes or litigates while his women-folk carry on the farm and household chores.

(*b*) Proper farming would fill their whole time. The Gurgaon zamindar is the most slovenly person in the world, and if his slovenliness could be broken he would be busy all day making his home, village and farm clean, tidy and comfortable and growing odd things to add to his comfort and convenience.

The uplift teacher would seize his spare time for reading, games, and general culture. There is no need to find anything but good farming and culture for all but the very smallest owners. If the menial castes can be given squares and put in the way of regaining their lost position in the world, then the work they now do will fall on the cultivating classes and besides greatly increasing their handiness and intelligence will provide them with subsidiary occupations and the desire and ability to make a living for themselves otherwise than by plain farming. Until the menial castes are removed it is idle to try and make the zamindars use their hands.

One of the difficulties of uplift and culture is that the Punjab is almost completely without a literature suitable for villagers either young or old, and this literature has to be brought into existence if the desire for learning and culture is ever to be general and insistent.

(*c*) Ignorance and stupidity. The zamindar has an idea that all work except ploughing and reaping is dishonourable. The idea is bred of idleness and the love of the *hookah* and is encouraged by seeing that his betters also have no idea of the dignity of labour. Until the dignity of

labour is taught in the schools and the gentry learn to handle the spade and axe, the theory that all personal effort and manual labour is degrading will continue.

(*e*) (*f*) Government will have its hands full for many years making up for lost time in the simple things already described. It will be time enough for Government to elaborate such a programme when it has killed the dung-cake habit, got the people to use a proper plough, and to clean their villages and their children, humanise their women and live rational healthy human lives.

(*g*) Every gentleman should make it a principle to grow his own fruit and vegetables and keep a flower garden tended by himself and his wife and family.

This would soon be copied and every well owner would busy himself with fruit, vegetables and flowers and rural unemployment in the well-irrigated parts would disappear, and people elsewhere would begin sinking wells in order to compete and be considered *raises*.

It is all a matter of propaganda to change the mental attitude of the people towards work, particularly manual labour; once it becomes the mark of a gentleman to grow flowers and fruit and vegetables everyone will compete to do so.

(*h*) Propaganda and propaganda only. This is being done in Gurgaon with remarkable results. Every sort of propaganda is utilised, and only the absence of money checks our efforts. But the first thing to do is, as has been done in Gurgaon, to work out for each district a complete and cheap remedy for all the ills of rural life so that propagandists may have complete confidence and an answer to all questions.

QUESTION 18.—AGRICULTURAL LABOUR.—(*c*) There are vast areas in Gurgaon of uncultivated land. The hilly parts should be turned into forests and the rest into pastures. The schemes found by experience best suited for the hills is for the people to close them effectively to grazing and cutting in return for a small remission of land revenue, while Government re-afforests them. If this could be put into practice vast benefit would accrue both by the clothing of the hills with grass and forests and by the stopping of the terrible harm now done in the plains by the water from these hills. The uncultivated area in the plains should be turned into pasture by a scheme of land revenue remission combined with bounties for cattle breeding. Gurgaon can breed cattle second only to Hissar, and this should be encouraged as the staple industry of the district.

Both these points are more fully discussed under (19) Forests and (16) Animal Husbandry.

QUESTION 19.—FORESTS.—(*a*) It is useless to sacrifice existing forests. This will only benefit those living near and is quite unnecessary, and will cause infinite harm.

(*b*) The encouragement, by every means in the power of the Government including land revenue remission, of the sowing with fuel, fodder, and timber trees, of all waste ground, *shamilat*, hills, sand-dunes, roads, the banks of tanks, banks of fields, bands, *gatwars*, *gora deh*, &c. Every available space should be planted with trees.

(c) Yes, the Gurgaon hills used to have vegetation on them but their neglect during British times has led to their denudation, with disastrous results. Huge areas are becoming depopulated owing to erosion, sand deposits, flooding, &c.

The remedy is clear and easy and was discovered 35 years ago by Mr. Maconochie: re-afforestation—proved by him to be not only possible but easy—and *bund* building. Unfortunately Government instead of accepting his experiments desires to make further experiments in afforestation so that many more years must elapse before the problem is seriously tackled.

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Meanwhile the Forest Department has warned Government that the soil will all be washed away if something is not done quickly.

(*d*) Afforestation and *bunds* in Gurgaon district will certainly do most of this and may do all of it. The proper methods of afforestation of this kind of country have been worked out and have been successfully tried in Gurgaon district.

(*e*) A magnificent opening for re-afforestation of the Gurgaon hills by Government-aided village schemes. The villagers should be persuaded to close their hills effectively to grazing; Government rewards this with a small remission of land revenue and proceeds to re-afforest by the methods best suited to each kind of area closed.

QUESTION 22.—CO-OPERATION.—(*a*) (i)—1. Putting more and more money at the disposal of the Co-operative Department so that it may be adequately staffed and not have to keep the work back as it had to do in Gurgaon for many years.

Government should increasingly use the Co-operative Banks for the issue of *taccavi* until finally that becomes the normal method of issuing *taccavi*.

2. Allowing Co-operative Banks and Unions to have accounts at the Treasuries and Sub-treasuries; and allowing all payments due to Government to be made through co-operative banks.

Local bodies should be allowed to bank with co-operative banks in any way they like, without any sort of check.

Pensions should be allowed to be paid through co-operative banks where so desired.

(*b*) All these societies are excellent and require the utmost support of Government consistent with not spoiling the movement by pampering.

(*c*) Legislation is absolutely necessary in order that village life may be organised in such a way that an organised majority can develop the village in spite of the opposition of the minority. The minority must be protected —some simple sort of appeal to the Collector would suffice to prevent majorities doing unreasonable or unfair things.

(*d*) Certainly, but owing to the department being starved for money it never had sufficient staff to carry on as it might, at any rate, in Gurgaon.

QUESTION 23.—GENERAL EDUCATION.—(*a*) (i) Higher or collegiate education is responsible for the training of many classes of our village workers and the present system inculcates an entirely wrong spirit which makes these workers a positive danger.

The dignity of labour is not taught, and the spirit of service is not inculcated and the students who pass through these institutions automatically lock up their women-folk, thereby making the uplift of the rural areas doubly and trebly difficult.

The dignity of labour, the dignity of women and the ideal of service must be taught by every means in our power if we ever wish to uplift the villages.

As an instance I note that Lyallpur Agricultural College spends (or did so a year or two ago) about Rs.1,000 p.m. on casual and menial labour instead of making its students do all the farm chores. The youths that come from Lyallpur are often unable to handle bullocks or plough well and I have heard them being openly mocked by villagers when they tried to demonstrate new methods of farming.

High Schools must have farms and teach agriculture, natural history, flower gardening, botany, and simple books must be produced about birds, flowers and butterflies, &c., and the children must be attracted towards the study of nature.

(ii) (iii) Village schools, middle and primary must teach what they can of the above subjects and all schools, high, middle and primary must teach

all that is known and can be made readily accessible for the uplift of villages.

The way this is being done in Gurgaon district is explained below. (*b*) (i).

(*b*) (1) The Gurgaon School of Rural Economy for the men teachers and village guides, and the Gurgaon School of Domestic Economy for the female teachers teach everything we can discover or devise for the betterment of village life.

The School of Rural Economy teaches: Agriculture, scouting, play-for-all, games, singing, village hygiene and sanitation, domestic hygiene and sanitation, infant welfare, public health, first aid, epidemiology, stock-breeding, veterinary (simple principles such as identifying the more important epidemic diseases, &c.), forestry, land revenue administration, the use of the magic lantern, lecturing, and village propaganda, and makes a great point of the dignity of labour by insisting on the students doing all their own chores. It also does what it can by practice and precept to inculcate this spirit of service.

The School of Domestic Economy teaches: Sewing, knitting, mending, cutting out and making of clothes, laundry, cooking, infant welfare, domestic hygiene and sanitation, village hygiene and sanitation, public health, epidemiology, first-aid, singing, games, toy making, use of magic lantern, lecturing, and propaganda.

Many of the women and some of the men will go to the boys' schools and teach all these things to the boys and girls.

The Gurgaon District Board is also insisting on the girls going to school with the boys in the village primary schools. The movement is gaining ground steadily and already over 600 girls are regularly attending village boys' schools. The result of this will be the killing of the dung-cake habit and the beginning of a new era.

The rest of the successful students of the Rural School will, if we can find the money, become Village Guides. A few have already been appointed by the District Board. Government was invited to initiate this great experiment but after considerable correspondence it proposed terms which would have killed the scheme and therefore the District Board is doing it on its own.

Unfortunately its resources are utterly exhausted in its attempt to develop the district in the place of the Government, and the scheme must come to an end sooner or later for the want of money.

Education on the above lines will keep the boys and girls in the village, increase their intelligence and retain their interest in the land.

(ii) Compulsion must remain a farce till the fields are fenced, so that swarms of small boys are not wanted to tend cattle, and fields cannot be fenced till holdings are consolidated. We are beginning the wrong end with compulsion before consolidation, just as we are beginning the wrong end with agriculture before uplift.

(iii) The schools have little or nothing to teach which is of real value in village life.

The village with a school is just as filthy, degraded and uncomfortable as the village without this luxury.

Until the schools adapt their curriculum to village life they cannot hope to win the place they should occupy in the minds of the villagers.

QUESTION 24.—ATTRACTING CAPITAL.—(*a*) A change of attitude on the part of Government and the rulers and great ones of the land. Farming, fruit growing, stock breeding, vegetable and flower gardening, and the study of nature must be the hall mark of a country gentleman as in England.

(*b*) *Bad education.*—They have learnt nothing to make them realise there is money in intelligently conducted farming. The dignity of labour is not taught, so that no man of education will touch a spade and till land-owners can do this and teach their own labour themselves they will never make the money they should out of agriculture. The proverb "if you want a thing done well, do it yourself" requires hammering in in India.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*a*) Hygiene will never really make big strides in the villages till the rural dispensaries are put under the Department of Public Health.

At present the village with a dispensary is just as dirty and unhealthy as any other. The doctor is not allowed to go from village to village supervising public health work and the Gurgaon District Board received a decided snub for directing the doctors to visit even two villages each week.

As soon as the rural dispensaries are put under the Department of Public Health, public health work will begin in the rural areas, while the stamping out of the simple epidemics like cholera, small-pox and plague will be an easy matter.

Maternity and infant welfare work must be taken into the villages. At present except for Gurgaon and possibly one or two other districts most welfare work is done in the towns although it is the village people who provide the land revenue and fill the army. They are entitled to at least that proportion of the attention that their numbers warrant in comparison with the numbers of the town population.

Apart from this the uplift of the villages is a matter of propaganda and solid hard work.

(*b*) A certain amount of money is well spent on this work as long as Government does not make the waiting for the results an excuse for doing nothing instead of immediately undertaking the big obvious things which have been crying aloud to be done for the last fifty years or more.

(*c*) I have conducted an intensive enquiry lasting over six years into the condition of the villages of the Gurgaon district and the broad conclusion is as follows:—

The people can easily be rescued from their dirt and degradation and their degrading and uneconomic customs, by an intensive uplift campaign in which a few very simple agricultural principles are pushed home as well as the uplift—principles already well known and requiring no research of complicated organisation—and they will become healthy, happy and comfortable, sufficiently fed and sufficiently clothed, but not rich.

QUESTION 26.—STATISTICS.—(*b*) The great remedy for the existing state of affairs is simple and obvious and has been so for many years and there is always a danger, if complicated inquiries and researches are set on foot and elaborate statistics collected, that we shall be tempted to hide behind this and do nothing in the hope that some *deus ex machina* will emerge from our files and do the work which we are neglecting.

The regeneration of rural India is just a matter of hard work and intensive propaganda along plain and simple lines, every department working together and playing into each other's hands.

We are doing what we can in this way in Gurgaon and would do a lot more if the money and good will of Government were more actively and obviously behind us.

Oral Evidence.

40,514. *Sir Henry Lawrence*: Mr. Brayne, you are Deputy Commissioner of Gurgaon?—Yes.

40,515. How many years service have you had?—21½; I came out in 1905.

40,516. How long have you been Deputy Commissioner?—I was Deputy Commissioner for a short time before the War, and I have been so for 6¼ years since.

40,517. And all that time in Gurgaon?—Since the War in Gurgaon, 6¼ years.

40,518. You have given us a very complete note. I gather you have various suggestions to make for the general improvement of your district. Perhaps your main point is that more attention is paid in the Punjab by the Agricultural Department to irrigated areas and irrigated crops than to unirrigated?—Yes.

40,519. Is nothing being done for unirrigated crops?—They have got cotton, *rosa bhatla*, which we use on unirrigated land, and we have S-A wheat, which happens to do very well under well-irrigation and as a rain crop. I do not think they have developed any crop particularly, either for wells or for rain land.

40,520. Are there any farms in the unirrigated area?—Not at this end of the Province.

40,521. None at all?—Hansi is the only farm this side of the Province, and I think that is on the Western Jumna Canal. The District Board of Gurgaon has got one or two small farms partly under well irrigation and partly depending on rain.

40,522. In the Punjab, do the District Local Boards undertake agricultural work?—We do in Gurgaon; I do not know about other districts; since the War I have been the whole of my time in Gurgaon.

40,523. We have been told in some Provinces that District Local Boards are not allowed to do any agricultural experiments; you have not been stopped from doing so?—In the District Boards Acts it is one of the objects which may be extended to districts, but actually it has not been extended to Gurgaon; we have been doing it for the last six years, and the question of extending that section of the Act to Gurgaon has been under consideration for a long time; we have asked Government to extend it.

40,524. You tell us in your note that you consider the uplift of the people should precede improvement in agriculture; that is your view?—Yes, very much so. In many places I consider they have enough money at present to live a very decent life if they knew how to; as long as they prefer earrings to mosquito nets and that sort of thing, I do not think it is much use helping them with agriculture.

40,525. That experience is somewhat different from the view that has been put before us by a good many witnesses, who say the people are not well enough off to improve their condition, and the first thing is to improve their economic condition by better agriculture?—I am in one of the poorest districts in the Punjab, I have been there for six years. I have visited thousands of villages. I have got 1,200 villages, I suppose I have been into every village once and many villages several times; I spend the whole of the cold weather and a good deal of the hot weather in the villages themselves, so that I have a very close acquaintance with the actual cultivators, delivering magic lantern lectures and hundreds of lectures without lanterns, and I have discussed every point in hundreds of villages. There are rich villages and distinctly poor villages, but from what I have seen of the canal areas, they do not seem to be very badly off if they did not waste their money; but when they are prepared to spend thousands of rupees on a marriage, which is much more than I spent on my own marriage, I do not think it is much good helping with agriculture until the wasteful expenditure is cut down. At the ceremony which takes place when some elderly relation dies, they are prepared to mortgage the whole of their land in order to feed 500 people.

40,526. Does litigation play an important part in their expenditure?—That is the principal hobby.

40,527. Even more than burying their relatives?—Yes; when they bury their relatives that is done with for about twenty years, and a wedding will end that expenditure for so many years, but litigation is chronic; it is like gambling: once they start they cannot stop.

40,528. *Sir Ganga Ram*: Are not wedding expenses being reduced everywhere?—We are cutting them down in Gurgaon; we have some tribes for which rules have been made that Rs.500 is all that can be spent on a boy's wedding, Rs.400 on a girl's wedding, and only fifty people are allowed to go in the procession. We have big panchayats; we hold panchayats every now and then to try and stop this wasteful expenditure; and jewellery is being reduced; I do not allow a man to come before me with ear-rings on: if he comes before me he has to take them off; that has a great effect, if he has his ear-rings pulled off in front of 200 people; we are fighting against this wasteful expenditure.

40,529. *Sir Henry Lawrence*: What is your general method of procedure? Have you got economy societies?—Propaganda.

40,530. I should like you to explain to us your method of conducting propaganda?—We start off with leaflets and posters, and we have got a District Gazette which goes into every village as a weekly publication; then there are magic lantern lectures.

40,531. Of whom do you speak as "we"?—I and my assistants.

40,532. You have no societies organised for this purpose into committees? —No, the District Board is one of my principal agents; it has got fifty members, who attend the meetings very regularly; the meetings last for three days every month; we have long discussions. Everything that is published is first discussed there and argued out from beginning to end; then I use the *zaildars* and *tahsildars*, and all my own revenue staff as far as they are prepared to help.

40,533. What is the unofficial agency?—The *zaildars* and the more intelligent of the *lambardars*. The *zaildar* is the most important squire in anything from 10 to 25 villages; he has to help in the collection of the land revenue and he has to help the police; he is a non-official, but it is his duty to see that all Government work proceeds smoothly in his area, and if he is a good man he is extremely powerful.

40,534. Is he appointed by Government?—Yes, he is appointed by the Deputy Commissioner; he gets a small honorarium twice a year with the harvest.

40,535. Is it hereditary?—No, he is supposed to be the best man in that area; he has to be if possible a *lambardar* or an ex-officer.

40,536. *Sir Ganga Ram*: It used to be hereditary?—No, not since I have been in India; in the Revenue Rules it is carefully laid down that it is not hereditary.

40,537. *Sir Henry Lawrence*: You have these gentlemen who work with you and for you?—Some of them are good and some of them are indifferent; the good ones can do anything in the villages in their *zails*, and we publish thousands and thousands of leaflets and songs; we offer prizes for good songs, and then we have choruses and madrigals, we have all sorts of things, everything we can get; we get these people with big drums and a harmonium to go round from village to village at this time of the year; we give them songs and give them a few rupees to sing them.

40,538. Where do you get the money from?—The Rural Community Council provides a certain amount, the District Board provides something, and the Public Health Department has recently been very useful in propaganda.

40,539. In providing money?—Yes; it is not very expensive. The Rural Community Council was started by the Education Department. I can never get a quarter of the money I want; I am always behind hand in paying for my printing.

40,540. Is that public money or subscribed money?—Not subscribed.

40,541. It is revenue derived from the public funds?—Yes, the Rural Community Council is financed by the Education Department, the District Board is financed from the local rate, and the Public Health Department is financed from the ordinary revenues.

40,542. *Professor Gangulee*: There is no voluntary contribution to the Council from the people?—They contribute to all manner of other things, so that I do not press them.

40,543. It is entirely from the Government?—Yes.

40,544. *Sir Henry Lawrence*: Has this movement been placed on a self-running basis? Supposing you left the district, would the movement continue?—The good that has been done I hope would last, but unless my successor had the same ideas as I have, a lot of it would be bound to die out. It is very largely personal; I have been there six years and so the people know me now; that is the main thing I have done: I have produced an attitude in every village; they are ready to listen and ready to try what I say, so that I can start a new thing in a very large number of villages by the issue of one poster. Six years ago I could have issued twenty posters without any effect whatever. They are prepared now to try what we say. At first they said it was all nonsense, they would not look at it; but by hammering away for six years people are awake, are prepared to listen, are prepared to try what we say and give it a fair trial. I had infinite difficulty in distributing Hissar bulls in my first year; now I cannot get a quarter of what I want.

40,545. What is the character of the population that you deal with? What class of people are they?—We have Jats, Ahirs, Meos, Rajputs, Gujars: all classes. The Meos are Musulmans, and we have Musulman Rajputs and Sheiks; but I think the proportion is two Musulmans to three Hindus all over the district.

40,546. Have you got Sikhs also?—No.

40,547. Is there a large percentage of Jats?—They are the second biggest Hindu tribe; the Ahir is the biggest Hindu tribe.

40,548. Have you had the greatest success with the Hindus or the Mahommedans?—The Meos are the most backward tribe in the Punjab; they come into this district and they go down to Rajputana, Bharatpur and Alwar; they are a Musulman tribe; they are by a long way the most backward, but they are extremely keen on improving themselves; they listen just as well as the more forward tribes. For instance, I have introduced marriage registers among the Meos with complete success; every marriage and widow re-marriage is registered now.

40,549. You mean by a *kazi*?—Yes, or I get the *lambardar* to do it. The other tribes will take to it, but they are not taking to it as quickly as the Meos. We are making marriage registers general for all tribes.

40,550. Does that reduce crime?—It will; it has not yet; it has only been going two or three years; they themselves think it will stop all the Section 498 cases.

40,551. You spoke of the depressed classes or some kind of menial tribes whom you wish to get out of the district in order apparently to induce the rest of the people to work; is that the point?—Yes. These menial classes are a standing disgrace to the people, the Chamars, Churas, Bhangis.

40,552. What percentage of the total do they represent, 5 per cent. or 10 per cent.?—10 per cent.

40,553. Have you any method of stopping the very heavy expenditure on litigation?—I have not thought it out. But I think the consolidation of holdings, the fencing of fields and such things would much reduce litigation.

40,554. Does fragmentation involve much litigation? Is there much litigation on them?—There is a lot of it. Also registration of marriages and the establishment of arbitration societies would reduce litigation.

40,555. Have you got any arbitration committees working?—They were all stopped a few years ago.

40,556. Why?—Mr. Calvert knows better than I do about it. We had the societies going very well, but orders came from above, and there is an end of it and nothing has happened since.

40,557. *Professor Gangulee*: Are there many lawyers in your district?—There are more lawyers than can make a living. They try to get other work now.

40,558. *Sir Henry Lawrence*: Could you let us know later what was the precise point on which the arbitration committees were turned down?—Mr. Strickland, I think, is coming before the Commission and he will give an exact answer.

40,559. Arbitration is encouraged in commercial matters and it is curious that it should be discouraged in matters of rural economy?—I did all I could by bringing forward resolutions, and so on, and they said nothing could be done, orders were orders.

40,560. Have you any particular complaints regarding methods of civil justice?—No; I have never looked into it. I know the villagers say that the scale weighs in favour of capitalists. They say that the civil judges tend to favour the capitalist class and tend to accept the word of a *sowcar* or moneylender in preference to the word of an illiterate cultivator; but I have never looked into it; that is what the villager will say.

40,561. Is it the case that the rural classes are not represented amongst the officials?—I do not think the genuine cultivator has any very big representation among the official classes. We get in Gurgaon district a lot of our officials from the Delhi city; they have no sympathy with the rural classes. I do not think there are many genuine farmers' sons in Government employment. If a Jat lives in Delhi city I would not call him an agriculturist. I do not think the actual land-owning villagers' children are employed to any great extent except as *patwaris* or school masters.

40,562. Do your school masters come from the rural classes?—They are beginning to. When I came five years ago, and even now, the vast majority have been either Brahmins or Mahajans. The Brahmin is nominally a cultivator.

40,563. On page 68 of your note one of your statements, "Government has already refused to allow the Gurgaon District Board to improve conditions by financial self-help," particularly refers to the matter of rates. What was the financial self-help you wished to obtain?—There was a Conference of District Boards at Lahore and the Minister told us that we could expect no more help from the Government than we were getting and we must increase our own resources ourselves. So I immediately put before the District Board the proposal to have a bull tax, not a tax on bulls but a tax of 2 pies on the land revenue so that we could buy more stud bulls. After a lot of propaganda and other work I finally got the District Board to pass it, but to our horror the Government never allowed it. The tax proposed would have amounted to Rs.20,000 a year and it

would have meant 100 bulls. We should require an indent of over 340 bulls a year, taking the question of cattle breeding seriously.

40,564. On what ground was that objected to?—I was never told about it. They merely did not pass it. I understood it was a matter of public policy, but I do not know.

40,565. *Sir Ganga Ram*: Who turned it down, the new Legislative Council?—It was never put before the Legislative Council.

40,566. The Government turned it down?—I think it was the Transferred Section. I kept on writing and I never had a final reply as to how it was contrary to the Government policy to allow us to tax ourselves. It was never put before the Council. If the bull tax had been passed I would have got a Pests tax. The grasshopper, for instance, is getting worse and worse every year.

40,567. Does the Local Board Act permit a District Board to levy an additional cess?—I think it would require legislation.

40,568. What is the cess at present levied in your district?—Two annas in the rupee on the land revenue.

40,569. So you have reached the maximum permitted by the law?—Yes.

40,570. That is the difficulty?—Yes. If I had the pest tax I could kill all the rats. As it is there are enormous numbers of rats every year.

40,571. How long is it since your cess was raised to 24 pies? Is it in your time?—Yes; I think it was in 1924.

40,572. Before that it was 12 pies?—It was 20 pies before; it was near the maximum before and we raised it to 24 pies.

40,573. How long is it since it was 12 pies?—Not since the War. I was away during the War, from 1914 to 1920. Certainly it has only been raised once after that and that is from 20 to 24 pies.

40,574. How high, do you think, is the district prepared to go in the matter of raising the special cess?—It is all a question of propaganda and what they want to obtain. The rat cess, for instance, I would not put on to the canal villages because they have not got rats; I would put it on to the villages that require it. We kill the rats and the villagers pay; we just present a bill. It is an unsatisfactory way of doing it, as of course there is no way of realising it. The villagers are slow in payment and the District Boards are out of pocket. I would rather have it legalised.

40,575. *Sir Ganga Ram*: You say that canal areas have no rats. They have plenty of them?—They are nothing like as bad as in other areas.

40,576. You remember that in the Agricultural Conference where you were also present a paper was read by Mr. Abdul Hussain who wanted to raise Re.1 per acre for the purpose of propaganda?—I cannot speak for the canal colonies, but in our canal tract the rats there do not give so much trouble as those in other parts. I have drawn up a few statistics* in respect of the actual results as far as they can be given by statistics and the progress made since I have been in that district for the last six years.

40,577. *Sir Henry Lawrence*: Could you summarise them very briefly and tell us what they are?—For instance, taking bulls, we had in 1920-21 only 8 and we have now 665; Hissar heifers, 123; stallions 16; castration of Brahmini bulls, 472. We have got every sort of stallion—thorough-bred Arab, country-bred and Welsh mountain pony, and have indented for Kabul and Yarkandi. We have got also Remount Department stallions.

* *Vide* Appendix.

40,578. Have you got any advice from the Remount Department or the Veterinary Department as to which breeds are most suitable to the district?—We work with, and get advice from, both the departments.

40,579. Does it tally?—Yes.

40,580. What is the revenue of your District Local Board?—The local rate brings in 2 lakhs.

40,581. And grants from Government?—I could not say off hand. Our budget comes to about 6 lakhs.

40,582. And you say you want more money. How much do you think you could usefully spend?—Do you mean for the actual development of the district?

40,583. You mentioned your scheme, but you did not mention what the financial aspect of your scheme was?—In the original scheme I asked for 3 lakhs a year. Then I worked out a detailed scheme including roads and everything else for which I reckoned on spending something like 50 lakhs in about ten years.

40,584. *Sir Ganga Ram*: Do you not get separate grants for roads?—They are very small; they are not enough to build new roads.

40,585. *Sir Henry Lawrence*: What do you mean when you say "very small"? Do you mean a lakh or thousands, or what?—I meant thousands, not lakhs.

40,586. Your rates are about 2 lakhs and your Government grants would raise that to about 6 lakhs. That would include education as well? What is the grant for education?—It works out to about a lakh of rupees.

40,587. What is the population of your district?—682,000; it was 750,000, but we have gone down some 20 per cent. in the last 20 years. I think we were the worst district in the whole world for influenza; we lost about 10 per cent. of the whole population. The influenza followed on a scarcity and famine and the people were not ready for it.

40,588. A great many people are claiming the record for that?—I do not know; I was not here at the time; I was in Palestine. I only heard it and Colonel Forster has given me a note about that.

40,589. *Sir James MacKenna*: You complain in one place of the transfer of your assistants, a fact which is common to almost all district officers. Do you find that those assistants who have been trained in this spirit of self-help have continued to foster and inculcate the same spirit in the districts to which they have subsequently been transferred?—Some of them do; it all depends on the lead they are given.

40,590. Have your methods of the *Ma Bap* type led to very much criticism in the higher circles? Does the Legislative Council consider it is in conflict with the principle of self-determination?—Questions are occasionally asked as to whether certain things are compulsory in the Gurgaon district and I have answered them; for instance things like the plague inoculation for the plague epidemics which we were determined to stop.

40,591. You think generally that the public is sympathetic towards the line of development which you are pursuing?—Yes, my own public is sympathetic, and the members of Council who belong to my district are one with me in this matter. Occasionally however a question is asked, and as a matter of fact in all about five questions are asked in a year and every one of them is generally by the same member.

40,592. You are very fortunate in having been left for a long period in one district?—Yes, I have done my best to stay there.

40,593. I was wondering whether it would not have been a distinct advantage to the Province as a whole if you had moved on to neighbouring districts

and thus brought a larger area under your influence in introducing this gospel of self-help?—I now have 21 years' service, and I am afraid that one would have to serve a great number of years in a place before he could hope to see his scheme in fruition.

40,594. What I was thinking of was whether, when you became a Commissioner, you would pay the same attention to your scheme as you do now?—It would all depend on circumstances. If the Deputy Commissioner of a particular district was not keen about it and did not want to do it, no Commissioner could compel him to embark on this scheme.

40,595. He could stimulate the Deputy Commissioner at any rate?—I do not know.

40,596. *Professor Gangulee*: I must confess that your note, together with your detailed programme, have been a source of inspiration to me and I have sent them to some of my Bengal friends, and I have no doubt that it will be of very great help to them. Are there many ex-soldiers who, after returning from the War, have gone back to the villages and taken to farming on their own holdings?—Yes; practically every soldier is doing it; and many ex-officers can plough their own land now.

40,597. How does the standard of living of these Jats compare with that of the people who have never been abroad?—They have dropped straight down into the old ways.

40,598. You do not find any change in their outlook?—None at all.

40,599. *Sir Ganga Ram*: Except that they have taken to tea drinking?—Yes, and also they would sometimes like a chair to sit on. They all brought back mosquito nets but their wives have turned them into shirts. I went to a Subadar-Major's house to inspect his family. I found he had two wives and several children, and there was not one window in his house; it was nothing better than a godown. He was drawing Rs. 110 a month, and he had plenty of land.

40,600. *Professor Gangulee*: You do not find these people of any great assistance or help in your progaganda work?—They are coming in gradually. The Subadar-Major of whom I spoke just now has changed since I spoke to him; when I get to meet these people personally, they quickly change their outlook.

I suppose some sort of a Mussolini influence is necessary to awaken the people.

40,601. What are the main crops there, chiefly wheat or gram?—We have something like 95,000 acres of wheat and 24,500 of gram every year. The biggest crop is *bajra* which covers 350,000 acres.

40,602. Is a great deal of the foodgrains exported or sold outside the village areas?—Very little. Our wheat which is the best crop is only about 95,000 acres; it is increasing slightly, but *juar* is going down. Gram is increasing, it is 245,000 acres.

40,603. *Sir Henry Lawrence*: Is all that wheat irrigated by wells?—Nearly all. I am trying to stop them growing wheat and to get them to grow more valuable crops, and I think we are succeeding in that direction. We have started potatoes, onions, etc., and they are taking to them quickly.

40,604. *Sir Ganga Ram*: Do you grow millets?—Yes.

40,605. *Professor Gangulee*: What is the average size of the holdings of those villagers among whom this propaganda work has been so successful?—It varies, I imagine, from anything between five and fifty acres. I am not sure about that; Mr. Strickland may contradict me.

Mr. F. L. Brayne.

40,606. Are there any subsidiary industries or spare time occupations in the village areas where you are carrying on your propaganda work?—Very little: they do not sell anything; they make their own cloth to a certain extent.

40,607. In other countries the formula for rural welfare is: "better farming, better business, better living," but you would put it the other way about. You would say "better living, better farming and better business"?—Yes, I would; I have seen such a lot of squalor, unhealthiness and suffering among the people that the very first consideration to my mind is better living. I think one child in every four will be found to be suffering from some eye disease; in fact I think I should say that one child in four would be found with permanently damaged eyes.

40,608. You would first of all give your villagers better living? Then you would have better farming?—I would bring in farming with it; but I would put all my weight into the factor of better living.

40,609. You, of course, very rightly emphasise the necessity of girls' education, and you say the first thing to do is to send the girls to school. Are you thinking of compulsory primary education for girls?—I do not think really that compulsory primary education for boys is a practical proposition at present, at any rate until holdings are consolidated. I would rather compel the girls and not the boys.

40,610. The consolidation of holdings would be a prerequisite to the introduction of compulsory education?—Sir George Anderson is using compulsion not so much to bring every boy there as to keep every boy when he does come. If you are using it on those lines then consolidation is not so necessary, but if you are going to get every boy there then you must consolidate the holdings first.

40,611. I see you suggest the creation of what you call a Director of Rural Uplift. Could that idea not be taken up by the District or Local Board?—The District Board does direct local uplift work under my guidance: I am the local Director of Uplift.

40,612. Are you the Chairman of the District Board?—Yes; if I had had the money I would appoint a man as an understudy to myself to direct the details of the uplift campaign.

40,613. You have not yet been able to get a man as your understudy?—I could get a man, but I have not got the money to do so.

40,614. Would the District Board not advance the expenses for the appointment of an understudy to you?—Certainly it would, but it has no money.

40,615. In answer to the Chairman, you said that five to six lakhs of income is derived from the District Boards? What proportion of that do you spend on education?—More than a lakh and a half.

40,616. Do you spend more on rural communications?—We have to cut down expenditure on communications as much as possible.

40,617. So that the major portion of the expenses is diverted towards education?—Yes, that is the biggest item.

40,618. You have not been able to persuade your District Board to give you a Director for rural development work?—They would do it to-morrow, but they cannot finance it. There is no disagreement between myself and the District Board; we are working absolutely together. I will never pass a resolution which, I think, the members individually disagree with; I go in for propaganda until they do agree with it.

40,619. Turning to agricultural education, you say every division must have its own agricultural college. Do you think there is sufficient demand for that?—If they gave agricultural education of a practical type there would be an enormous demand.

40,620. You are acquainted with the Lyallpur Agricultural College?—No. I was District Judge at Lyallpur before the War, but I know nothing about the college.

40,621. Have you come across any graduates turned out by the college?—Yes. The trouble is they are not practical. They cannot hitch a pair of bullocks into a plough and drive them, and the villagers laugh at them and call them "Babujee." Once they do that they will never take their advice on farming matters. I have heard them shout at a man across a field, "If you want to plough you must take your trousers off and put a *dhoti* on." That sort of man would not be of much use.

40,622. Is there any graduate from that college in your village?—We have four Agricultural Assistants, of whom one is employed by the District Board and three by the Agricultural Department. There is also an Extra Assistant Director of Agriculture. That is the whole agricultural staff.

40,623. Do they take an adequate interest in your propaganda work?—Life would not be worth living for them if they did not. They co-operate with me very well. Every department helps me in the district; all the local officers subscribe to the programme, and assist in drawing it up.

40,624. When you state on page 64 that the richest districts get *taccavi* at the same rate as the poorest, do you refer to the rate of interest?—Yes. It is 6½ per cent. for all.

40,625. Your suggestion is that it should be varied?—Yes.

40,626. You also suggest that *taccavi* should be freely remitted in the case of development schemes?—Yes. If a village takes *taccavi* for an afforestation scheme or a tube well and it fails, Government should remit it.

40,627. We have been told that Hindus have a prejudice against the destruction of monkeys, but I see you refer to "monkeys which the cultivators would gladly see destroyed, but the non-agriculturists object." Is that your experience in your village?—Yes; the Jats would willingly see the last monkey shot. Hindus have asked me to kill all the monkeys, but I say, "They are your monkeys, not mine."

40,628. They do not object?—The agriculturist puts his crop first. They tell me their religion says that all animals which destroy the crops may be destroyed. Hindu cultivators have told me that.

40,629. You suggest the separation of the Agricultural and Veterinary Departments. Could you expand that a little and tell us what your reasons are?—The Cattle-breeding Department should be a very big one. I want 340 bulls a year; Hissar cannot produce my indent alone. Everyone wants cattle, either for transport or milk or ploughing. We want a large staff not only for producing bulls, but for watching them, inspecting the produce and teaching animal husbandry generally. To my mind it should be quite as big a department as the Agricultural Department.

40,630. *Sir Ganga Ram*: Do not people let loose Brahmani bulls in your district?—I have been discouraging it, but it is difficult to do so, because Hissar cannot produce the bulls I want. My indent has been cut down 50 per cent. If I could get all the bulls I want from Hissar I should be completely against the loosing of Brahmani bulls. One of the items in my programme is: "Do not loose Brahmani bulls; or, if you do, get them passed by a veterinary officer first."

40,631. *Professor Gangulee*: Do you think this movement has made such an impression on the people that it will go forward even in your absence?—Yes. There is not a single village where the question of whether this programme is to be carried out or not is not a burning one. The programme includes bulls, banks, Persian wheels and manure pits. I have had dug 30,000 manure pits 6 feet deep. The old heaps have gone from every village

in the district. I should like a live organisation to keep it going. If I disappeared to-morrow a lot of the work would disappear too, and the work done not only by myself (I do not grudge that) but by many others would be wasted.

40,632. Do you get any assistance from Missionaries?—We have not got many, and they are more in the towns than the villages. The Missionaries all agree with me; I do not preach anything which people do not agree with; I either convert them or modify my programme. I am not going to go contrary to the best local opinion.

40,633. *Mr. Calvert*: I gather you are depending on a large-scale propaganda campaign?—Yes.

40,634. You are basing your policy on the education of the people?—Everything depends on propaganda; I can do anything by propaganda.

40,635. And with suitable propaganda great improvements can be effected in certain directions without the expenditure of much further money?—Yes.

40,636. That is to say, such things as getting the children to school and stopping the making of dung cakes are not expensive?—No. I can stop the making of dung cakes in three years, given the propaganda and magic lanterns and a certain amount of staff and any amount of literature. I have stopped a great deal of it already.

40,637. So that rural improvement is not wholly dependent on increased taxation?—No. As I say, I can double their crops and halve their disease (that is my slogan) if they follow what I say, and very little of what I tell them needs much money to carry out. Disease, of course, is terrible in the villages.

40,638. You refer to pastures. Do you think you can possibly have pastures without rainfall throughout the year?—Fodder crops must be grown. In the Gurgaon district you cannot get enough off the pasture to feed the cattle for twelve months; there are certain months in the year when you must have fodder crops. You can get an excellent hay crop. We can grow grass waist-deep in places, both on the hills and in the plains, and we can cut and stack the hay. There is good grazing till November; after that the hay has to be used, and then we must have fodder crops; but a great deal can be done with pasture.

40,639. Would you stack rather than make silage?—I have not had the time to experiment with silos. If I had the staff and a little more time I would do something in that direction, but as it is I have not been able to.

40,640. You say you have over 1,300 iron ploughs in use. Do you think the people are so converted to them that they would go on using them even if you left?—In certain villages I forced the *zaildar* to take one plough and try it. I found out afterwards that one such village has now 60 iron ploughs; one *zail* has now 120. The man who used to be the biggest enemy of the iron plough now has five; it took four years to convert him, but now he says he will never go back to wooden ploughs.

40,641. You are largely responsible for the Gurgaon plough?—Yes.

40,642. Does that differ much from the one recommended by Lyallpur?—It is similar to the Raja, and has been brought up to date. It does not plough any better than the Raja, but it has certain improvements which appeal to the zamindar.

40,643. *Sir Ganga Ram*: Is it cheaper?—Yes. It is made at Cawnpore, and the price of the last consignment works out at Rs.32 each.

40,644. That is the price of the Raja?—Then it has been brought down to meet the price of mine. It did not come down until I introduced the Gurgaon plough, and then it came down with a run. The price I quoted

includes the chain, which is worth several rupees. Without the chain it would cost Rs.28.

40,645. *Professor Gangulee*: Is it manufactured by a private firm?—Yes, the Empire Engineering Company.

40,646. *Sir Ganga Ram*: You have not infringed the patent rights of the Raja?—That is the manufacturer's lookout! I think the Raja patent (if there was one) has expired. I do not know what parts of the Raja were patented. I hope they have patented the special parts of the Gurgaon plough, but I do not know yet whether they have.

40,647. *Mr. Calvert*: I think you have held ploughing contests attended by ploughmen from the different districts of your Division?—That was the Divisional championship. We first held a district match against Rohtak, and then I suggested a Divisional championship. The Agricultural Department took it up, and last year was the first year of it; this year will be the second. My district championship is now in its sixth year.

40,648. In the Divisional championship, did you win or did Rohtak?—Gurgaon won.

40,649. So the use of this iron plough and skilled ploughing are spreading in your district?—Yes, and if I had more time they would spread much faster.

40,650. There is some hope that the use of the iron plough will last?—If I could afford the time for an intensive plough campaign I would make certain of it lasting, but I have too many irons in the fire to devote much attention to ploughing. I have a hundred people wanting ploughs now, but I do not happen to have any in stock.

40,651. *Professor Gangulee*: Do they realise its importance?—There are hundreds of zamindars now who realise it is absolutely essential, and the number is increasing every harvest.

40,652. *Sir Ganga Ram*: Is there no private company to hire them?—I should be sorry to hire a plough to a zamindar; they leave their things about in a terrible way.

40,653. *Mr. Calvert*: Your Persian wheels would also last?—Certainly.

40,654. How are you overcoming the difficulty of repairs to a Persian wheel?—We arrange a class for local smiths. We have big factories in Gurgaon now in various parts of the district. The village smiths were to come there; the District Board was to pay a little money for the damage they did while they were learning there, and they were to learn running repairs by helping to make these wheels; I told the villagers that unless the *lohar* learned to mend these wheels they should refuse to pay him his harvest dues. Now the Persian wheel is part of the village stock in trade, and the *lohar* must keep himself up to date.

40,655. *Sir Ganga Ram*: Do you make your own Persian wheels?—There is a firm which has put down a plant, and they can turn out anything up to 200 wheels a month.

40,656. What does it cost?—Rs.100 for the machinery, Rs.1 per bucket for the bigger buckets, and 14 annas for the smaller size for deeper wells; it works out at less than Rs.200 complete.

40,657. *Mr. Calvert*: Can the repairs to the iron plough be done locally?—No, but I have got spare parts on sale in every tahsil, and there is not much breakage; the woodwork, of course, they can mend. The tip is the principal thing that breaks. The wheel occasionally breaks, but spares can be got at every tahsil.

40,658. The effect of putting 665 Hissar bulls into one district will not be lost for many years?—Unless it is kept up the breed must deteriorate; neither the veterinary people, nor myself, nor the zamindars will claim that

if you put in that number of bulls, you have permanently improved the breed of cattle; we are starting on very inferior stock, and that has got to be graded up through many generations; if this supply of bulls stopped now and no more were bought, in possibly twenty years you would not know they had ever been there. I do not know how long that would take, it is rather a complicated problem as to how long the effect of those 600 bulls would last, but it certainly would not last for ever. Another factor is the feeding; unless the young stock is well fed it must deteriorate very rapidly. Of course, we cannot get the people to feed the cows properly; they neglect the cows just as they neglect their girls; they think they need not bother about their female stock, whether it be animal or human.

40,659. *Professor Gangulee*: Even if they have enough fodder?—They neglect the female calves. In future we are going to give all our prizes to cows and heifers, so as to encourage the proper feeding of cows. With regard to horses, they do the opposite; they will not feed the young male stock of horses, so that they lose money there.

40,660. *Mr. Calvert*: Have you now got a co-operative society in most of your villages?—I would not say that, because the better villages have three or four societies if they are big villages, but if the Co-operative Department had the staff they would have one in every village in six months; they all want them, and over half of the villages have got co-operative societies. I have 1,350 revenue estates, of which 100 have no village; there are about 1,250 inhabited villages, and certainly half of them have banks; some tahsils are better than others; the ones that started first are better.

40,661. Do you think the people now understand co-operative principles?—I would not go so far as to say non-members do, but they appreciate the advantages. The education of the members is proceeding very rapidly; I think the average member does understand the principles.

40,662. *Professor Gangulee*: These are chiefly credit societies?—Yes; we are also starting better-living societies; it is really a question of staff, and credit is the more important in order to get them out of the hands of the moneylenders.

40,663. *Mr. Calvert*: You say the working capital of these societies is now about 24 lakhs; is that affecting the moneylenders?—The moneylender is putting his money into the bank; in Rewari, which is our biggest bank, it is almost entirely moneylenders' money, I believe.

40,664. Do you think individual moneylending is declining?—It must be, because I think at least half our members have cut adrift from the moneylender and do not take any more money from him; I think moneylending must be reduced. Moneylenders themselves say there is no business now; that is partly because we are getting a series of bad years, and I think it must be partly because of the co-operative banks, though the moneylenders will not admit that to me, but I think it must be beginning to effect what I call personal individual moneylending.

40,665. I gather that on this question of consolidation of holdings you would face a certain amount of injustice which might follow from compulsion in order to secure speedy consolidation?—Yes, I would. I think the advantages are so enormous and they are so patent to everybody that we should risk 1 per cent. of the villagers being adversely affected in the re-distribution. I would have some sort of appeal, so that the Revenue Assistant or some special man under the Collector could look into any cases of supposed injustice; but I would not hold the whole thing up for the 100 per cent. agreement, any more than I would hold up the building of a road or a railway because it went through the land of somebody who did not want to sell.

40,666. How are you encouraging the sinking of wells?—By *taccavi*.

40,667. Is there a boring staff at work in the district?—Yes.

40,668. Are they useful?—They could be much more useful; it is supervised from Lyallpur, which is rather like supervising Surrey from Glasgow. It would be better if it could be supervised from Delhi or from somewhere much nearer. Then there is always this question of irregular payments; I have asked them to give orders that no payment is to be made direct to the boring staff, but that all payments should be done on a bill through the tahsil, so that the villager will know that any demand for money is irregular. Then there is the question of overhead charges, which, I think, should be abolished in a poor district which requires development; Government should agree to lose that money or call it development. If I could get rid of the overhead charges, have regular payments and good supervision, I could bore almost every well in the district. People are very keen on it.

40,669. We have had evidence that the Agriculturists Loans Act is now practically obsolete and should only be used in cases of emergency; I gather that is not your view?—Whoever said that had better come to Gurgaon; I simply cannot get enough money; I have run out now. Persian wheels are all put up on *taccavi*, iron ploughs are bought with *taccavi;* I will give *taccavi* for almost everything that is in the nature of development.

40,670. You still regard *taccavi* as a normal method of financing agriculture?—Until the co-operative society can do it. I give *taccavi* to co-operative societies; it saves me the trouble of issuing it.

40,671. *Sir Henry Lawrence*: What is the grant of *taccavi* in your district?—I have got 3½ lakhs this year.

40,672. Is that sufficient?—No, I could do with another half lakh before the end of March; if I had more *taccavi* I could issue it.

40,673. *Mr. Calvert*: What is the position with regard to recoveries?—They proceed normally. In a bad year I suspend recoveries but it does not amount to very much.

40,674. Have you been forced to remit *taccavi* as irrecoverable?—I remitted large sums when we had that bad flood two years ago, and the people have not recovered yet because they cannot get a good harvest; by large sum: I mean Rs.20,000 or that sort of thing.

40,675. *Taccavi* given out for wells, ploughs and similar purposes is all being recovered?—Yes.

40,676. So that Government is not being involved in any loss through this extensive use of *taccavi*?—No, none whatever.

40,677. Have you any difficulty in getting these improved seeds in the amount required?—Yes, my indent is generally cut down. *Bajra* I cannot get at all or I only get it in microscopic quantities.

40,678. Can you get wheat?—I can get more wheat, but the difficulty is that it all has to be distributed almost at the same time, and the agency for distributing it is so defective that I am liable if I get a big indent to have it on my hands. If the distributing agency were satisfactory I could replace the whole of the local wheat in a couple of years by 8-A; it is so much appreciated.

40,679. Is the agency the Agricultural Department or your own?—The Agricultural Department supplemented by my own efforts; I would like them to do the whole thing but they have not got the staff.

40,680. Is the wheat sold for cash or is it recovered in grain?—*Taccavi* mostly; the Department will not sell except for cash, and therefore, as the people never have any cash at sowing, I guarantee *taccavi*; but now I have run out of *taccavi* and so they will not get their money this year.

40,681. The neighbouring Province gives out improved wheat seed on the system of taking 1¼ at harvest; do you think that would do well at

Gurgaon?—I should like to try it before saying; I do not like to give an opinion on anything I have not asked the villagers about.

40,682. Have you had any experience of these Coimbatore canes?—Yes, on a small scale; we are not yet a cane district, but the Ingram Estate grows it, and I am trying to grow it under well irrigation; people who do grow it are very pleased. There is one variety of cane which is so hard that nothing can bite it; I forget what the number of that is. There are several kinds with which the people are very pleased.

40,683. With regard to your complaint against the student turned out from the agricultural college, do you think the agricultural education should be more adapted to the small holdings; is that the idea?—If a man is going to teach the villager how to farm he must be able to farm himself, he must be able to yoke in the bullocks, drive a plough and adjust a plough; there must be no farm work of which he is frightened; he must be absolutely able to get down to it and then the people will listen to what he says. The people are extremely suspicious of anyone in the nature of a "Babu" who they think is not one of themselves.

40,684. Is your rural economy school working well?—Extremely well; of course, the trouble is money; the District Board has been put to enormous expense which it cannot meet, but the new lot of students who are now in the schools I think will be extremely good. The first batch were not so good; we did not know then where the thing would develop to. We only took in teachers, and we made the alarming discovery that our teachers were largely, as I said before, non-agriculturists, so that we had not as good a selection as we have got this time. This time we have taken all the waste products of the high schools, so to speak, the entrance-passed agriculturists.

40,685. *Professor Gangulee*: Is the medium of instruction English or vernacular?—Vernacular; there is no English spoken in the Gurgaon district.

40,686. *Mr. Calvert*: Is this school of rural economy based on the Moga institution?—No, it is thought out by ourselves in the district; I have never seen Moga. I wanted certain things taught and I found I had no one to teach them; I first thought of teaching the *patwaris*; then I thought I might teach the school masters, and then I thought of the idea of educating the sons of the farmers and using them as propagandists, what I call village guides. The whole of this propaganda campaign has been developed in Gurgaon itself.

40,687. You showed me some of your manure pits; have you thought of any method of getting the cattle urine into these pits?—No, I have not, and as the pit is such a mixed bag, you cannot stable the cattle over the top; I do not quite know how we are going to do that; I have not started on that problem; it obviously must be tackled.

40,688. Practically the success of your campaign for these manure pits will remain in doubt until it comes out as manure?—It has come out in certain villages, and they tell me they have got crops of which they have never seen the like before.

40,689. You mean it is really appreciated?—Yes, that is why I say the pit is one of the things that will survive me.

40,690. *Professor Gangulee*: How did they solve the problem of fuel?—We have got a rainfall of 20 or 22 inches and we can grow trees.

40,691. *Mr. Calvert*: Does your district show any different results in the proportion of boys who get to the fourth primary class?—The proportion is small. I do not know where they go, but I think they must go out and tend the cattle.

40,692. You have not been able to keep the boys through the full primary course?—Not as many as we should.

40,693. *Mr. Kamat*: I have read your memorandum and your propaganda leaflets with a great deal of interest and I very much appreciate the work which you are doing. But, as a matter of general policy or as a matter of perspective, if I ask you a few questions I hope you will not misunderstand me. Now do you think that in every district the Deputy Commissioner can carry on propaganda like this in India?—No, he could not in the heavily worked districts. For instance, it would be very difficult in big towns like Amritsar and Lahore where there is much political work to do.

40,694. So there are many accidental factors in this whole story of yours which must be taken into account? For instance, you happen to have been in this district for a continuous period of six years. Is that likely to happen every time in every district?—I have always tried to stay, but I do not know to what extent in other districts the Collectors do like or try to stay. I use effort to stay so that I can get my policy carried out and see the results.

40,695. Then again in your district you happen to be the Chairman of the District Local Board?—I think it is the case all over the Punjab except in one or two districts.

40,696. In other Provinces there are District Boards which have got non-official Chairmen?—I could work outside the District Board; but it provides a useful medium. Without it I could still carry on this programme.

40,697. But the mere fact that the Collector of the district can provide the motive power for the members of the District Local Board goes a long way. That sort of influence probably cannot possibly be exercised by a non-official Chairman if he happens to be an enthusiast; so that, if you take that fact into consideration, is it possible to have a similar propaganda in districts where there are non-official Chairmen?—Each department will have to do the propaganda. For instance, health propaganda would be carried on under the Public Health Department; the Co-operative Department and the Agricultural Department should also come in; it is a mixed programme; every department is interested.

40,698. The point is not which department can be brought in to do the work. I am asking you; is it possible that the personal influence which the Deputy Commissioner can exercise over the District Boards could similarly be exercised by non-official Chairmen?—It depends entirely on the personalities of the non-official Chairmen, I suppose. I have not seen a district in which that is the case so that I am rather in the dark as to how it would work out.

40,699. Then again, you carried out by your influence certain very good improvements, for instance with regard to iron ploughs. Strictly speaking, would it be the function of a Deputy Commissioner to carry on a campaign with regard to iron ploughs in his district?—The Deputy Commissioner in the Punjab is described as the head of the district, and I do not consider any beneficial activity whatever to be outside the sphere of his duties. Anything for the betterment of the people is, I think, a part of his duty.

40,700. But in other Provinces, if the Collector thinks that propaganda on iron ploughs should be carried on by a private firm or by a non-official agency or by the Agricultural Department, would he be considered to be wrong?—I can hardly sit in judgment over other Collectors. But if I could persuade a firm to introduce any improvements it would be a very good thing. I wish the implement makers would do it.

40,701. In your note you blame the Government for not giving sufficient response in the matter of your schemes for uplift sent up to them. Here

comes in a question of policy, and it is that point which I wish to bring out. Now, if a Collector, as I have said, tries to carry on propaganda about iron ploughs and various other matters and if the schemes are turned down by the Government, is it entirely the fault of the Government?—It depends on the reasons under which they are turned down. If it is stated to be against public policy there is an end of it.

40,702. It is a matter of opinion, therefore, whether propaganda for uplift which you put forward as the first plank should come first or whether it should be simultaneous with the improvements which the Agricultural Department or the Co-operative Department is carrying on?—My programme is to carry on together.

40,703. It is a matter of opinion, as I say, whether it should not be a simultaneous process carried on by two or three departments, the Agricultural, the Co-operative and the Revenue, whereas according to your scheme it is the revenue officials who ought to carry on the combined propaganda; is that a correct policy?—I am only helping the departments. All this has been done by the departments working in the districts. The public health campaign is done by the Health Officer and I help him.

40,704. *Professor Gangulee*: You are really acting as a correlating agent?—I am helping the Health Officer.

40,705. You have a District Health Officer?—Yes; we work hand in hand. I can do nothing without consulting him; there is no suspicion of any friction.

40,706. *Mr. Calvert*: You have an Assistant Registrar of Co-operative Societies in your district?—Yes; he distributes my propaganda stuff.

40,707. *Mr. Kamat*: The whole thing according to your scheme depends on personality. For the moment the Punjab is lucky in having its Stricklands, its Calverts and its Braynes in every sense of the term (if you like you may have it as "brains" or as "Braynes"); but that is a happy coincidence for the time being. Ordinarily, will the Government accept the policy that the Revenue Department must carry on uplift first without reference to any non-official agency or anything of that sort?—But I am working with every other non-official agency which is working; I use everyone. I am working with every department and also working with the non-official agency. I am not in any sense a separate show.

40,708. The moment you disappear from the Gurgaon district, what will happen to the wholesale propaganda which you are carrying on?—I think my successor will continue it.

40,709. Will he necessarily carry it on?—Not necessarily. I cannot dictate his policy, but he is expected to continue the policy.

40,710. Therefore this cannot be the normal feature of the normal machinery?—I think it ought to be; I think that Government should insist on the policy being carried on.

40,711. You put the question of uplift first. Uplift means, I take it, educating the villagers, educating them on sanitation, better living and so on; does it not?—Yes.

40,712. Educating by leaflets?—By every sort of way.

40,713. And by word of mouth?—Yes, and by schools.

40,714. But the whole foundation is education?—Everything is education.

40,715. If they had had, fifteen years ago, the benefit of primary education by the introduction of compulsion your propaganda to-day would have been easier?—It depends on what they were taught.

40,716. Your task now is more difficult because there is not the foundation of primary education; their level of intelligence is low?—I do not quite follow you

40,717. The whole of your propaganda work hinges on the level of intelligence of your villagers and you are educating them by leaflets and other agencies. Now if primary education had been introduced fifteen years ago, your task would have been much easier to-day?—On the other hand it might have been harder.

40,718. Primary education first or propaganda by these external methods, that is my question?—Education tends to send all the bright boys to the towns.

40,719. Are you beginning at the right end, that is my point?—I think the education which we teach them now will keep them in the villages. Fifteen years of education without this might have sent more into the towns.

40,720. You have to put more energy into your propaganda and your magic lantern lectures and your demonstrations because the level of intelligence has not been raised higher on the foundation of primary education. If that had been there the villagers would have understood more easily your principles of sanitation and better standards of living and your energy would have been saved?—I would not admit that. I make my programme so simple that even without any education they understand what I am teaching them.

40,721. You do not admit that the stage at which you have to begin first is to lay the foundation of primary education?—I can do this work without that. I can make them dig pits and appreciate the value of manure and stop the making of dung cakes without education.

40,722. And you think this is the right end of the stick as a beginning of the uplift work?—In fact I teach this in the schools as part of primary education; I do not think it is necessary for everybody to read and write in order to understand the value of this programme.

40,723. With regard to some of your other facts, nobody disputes the point that the elevation of women ought to be the first plank in the propaganda work in this country; but comparatively speaking, taking a proper perspective, are you quite sure that you do not exaggerate when you lay at the door of this problem all the evils in the village?—No; I have not exaggerated at all.

40,724. Have you visited Burma?—Yes.

40,725. There the position of the women, their education and their rights and liberties, are far higher than in India?—Yes, they take a much higher place.

40,726. Is the economic position of the cultivator in Burma in any way better than that of the cultivator in the Punjab or Bombay?—That I have not compared; I have been only for six months in Burma.

40,727. Again girls' education in Travancore and Malabar is so far ahead that practically every girl goes to school and knows the three R's and almost knows how to live well; but is the economic position of the cultivator in Travancore or Malabar any way better than the position of the cultivator in Gurgaon?—I have been in that part of the world for only two months and I do not know how their farming goes at all.

40,728. No doubt the elevation of women is admitted by all Indians to be a very good principle; but whether the economic position of the villager would thereby be improved is the question?—I want to make them lead more human lives. The economic position will be partially improved by their living better lives. There will be more intelligence and their efficiency will be greater; there will be less disease and less suffering.

40,729. You have given us a copy of the paper which you have read recently at a Conference in the Punjab. You say therein that in the Indian village there is not the same sort of agency as in the English village, namely the parson and his wife, for rural uplift. Do you happen to know that in ancient India the village Pandit or Guru was as highly respected and as great a force in the village life as is the parson in England to-day?—No, I have not studied that. I mean to say that I am too busy with present-day conditions to study ancient India.

40,730. That is precisely the point: you make a beginning with to-day without looking back upon India's past?—I am talking of things as I find them. I do not think that one can rehabilitate the past.

40,731. For instance you say that there is no love of flowers in an Indian home as there is in an English home. Taking ancient India again, I might tell you that every Hindu had to make an offering of flowers to his idols, to his God, before he was able to take his food?—I shall use that in my propaganda; I shall point it out to the villagers.

40,732. Then you mention the utter lack of cheerful songs, and you say that the parents would think it wrong if the children did sing at all. I can recite to you verses to show that singing is a compulsory duty of every Hindu, that he must sing every day?—That too would be very useful for my propaganda.

40,733. I can show you instances in which women have been carrying flowers in their hair and about their person, which shows that every woman has cultivated a taste for the beauty of flowers?—That is one more aid to my propaganda.

40,734. I am just mentioning these things to show that one should not begin with a wrong perspective of village life in this country?—These are the conditions as they exist in my district, and if I can show the people that I am merely taking them back to a golden age of long ago, then it would be all the better.

40,735. You have said in your note that the villager cannot sing a single cheerful song in order to make his or her life happy. If I take you to Gujarat you will see that almost every woman there can sing in chorus, and if your wife were to hear them she would simply be delighted?—Yes, but we are disappointed with Gurgaon singing.

40,736. I can also take you to other parts of the country where you will find that on certain occasions the women can and do all sing together?—I am very glad indeed to hear that, and I shall use these facts in my propaganda work.

40,737. Now, to come to non-official agency: I should like to know why you do not use the non-official agency to a greater extent than you do at present? For instance lawyers can be made use of?—I have nominated two lawyers as members of the District Board.

40,738. Recently when we were in Berar we found that the whole of the co-operative movement there was being run by lawyers, who have sacrificed a great deal of their time and money in the advancement of that movement?—The Secretary of the Central Bank is a lawyer; both Joint Secretaries are lawyers. There are three lawyer members of the District Board and one has now become a Munsiff, a sub-judge. The Honorary Editor of the District Gazette is a lawyer and the Honorary Secretary of the High School.

40,739. For instance, I may tell you in the Legislative Assembly I can point to two lawyers who come from my own Province (Bombay). One of them could have become a High Court Judge, and the other is perhaps sacrificing a practice at the bar which is more than that of a High Court

Judge's salary in the country's cause?—The number of lawyers helping our work is increasing.

40,740. *Sir Ganga Ram*: What part of your district is irrigated by the Agra Canal?—The canal runs down parallel with the Muttra Road, and it irrigates about 40,000 acres in Palwal and a little bit on the west.

40,741. Could not that irrigation be extended?—No, it is now divided between three districts: Gurgaon, Muttra and Agra. We are only entitled to a third of the water; we cannot get another drop more.

40,742. Is that laid down anywhere?—The Punjab has got 6,000 more cusecs in the Western Jumna Canal than it is entitled to. The question was raised as to whether this was to be taken back by the United Provinces, and the Government of India decided that it could not be done; it is very unlikely that the United Provinces after that decision will hand us over any extra water in the Agra Canal.

40,743. There is plenty of water in the Agra Canal, is there not?—It is fed from the Ganges.

40,744. Have you ever represented this matter?—Yes, again and again. The Punjab Government made attempts in this direction, but they were finally turned down, and we cannot get any more water.

40,745. Do you think that very good use is made of the water that is got?—No, very poor use is made of it.

40,746. Is it under the Engineers of the United Provinces Government?—Yes.

40,747. What area is irrigated by wells in your district?—About 80,000 acres of crops a year.

40,748. How much does a well command?—Anything from 5 to 20 acres, according to the depth of the water.

40,749. What is the variation in the depth?—It varies from 10 to 100 feet.

40,750. You cannot work a well 100 feet deep by the Persian wheel, can you?—I cannot get them to try it. I have told them to try it, and I have promised to return their money if they fail.

40,751. It would not be successful beyond 40 feet?—The first Persian wheel that was put up was successful with 50 feet: it was really a great success.

40,752. Is it better than the *charsa*?—Up to 60 feet it gains enormously over the *charsa*.

40,753. Have you tried boring in the wells to augment the supply?—Yes, we have.

40,754. By how much is the yield increased in that way?—It sometimes doubles it.

40,755. How deep do you go with the boring?—I do not think we go more than 100 or 110 feet.

40,756. Is any Government subsidy given for this?—No.

40,757. I suppose you are aware of the fact that in the United Provinces they give regular subsidies to the people?—I only heard about it from Mr. Calvert about a couple of days ago.

40,758. With regard to tube wells: have you any idea whether the Mandi electric scheme is being introduced in your district?—No.

40,759. Have you any tube wells?—No. I have asked the Government to make a demonstration in tube wells, and pointed out that unless it is proved to be a success the people will not invest their money in it.

40,760. You have not heard of the new scheme with which I am experimenting? I am drawing water by compressed air from a series of wells?—I should like to see that tried in the Gurgaon district.

40,761. It would pay you very well indeed to try it in Gurgaon?—Yes, I wanted somebody to take *taccavi* loans and do that job, but so far nobody has come forward.

40,762. Are there any rules laid down to the effect that District Boards must spend a certain percentage of their income on roads?—There are rules about education and agriculture, I think; nothing about roads. But I must say that roads in Gurgaon are nothing like as important as, for instance, cattle-breeding.

40,763. Has there ever been any scheme for the storing of water in tanks?—The Drainage Board deals with bunds.

40,764. I was thinking of a scheme such as the bunding of a low-lying tract or valley in order to store the water. Is such a scheme possible in your part of the country?—Yes, it is possible in dozens of places; it is all a question of money.

40,765. If such schemes were carried into fruition, do you think that the people would be willing to pay double the canal rate?—No; until it has been demonstrated that the supply of water is fairly certain, I think it would be unreasonable to ask them to pay very high rates.

40,766. Supposing the Mandi scheme of electricity was introduced here, I just wanted to know whether the people would be willing to pay double the rates, because you know that lift water is more expensive than flow water?—For a certain supply of water, I think they would be willing to pay. Of course, at present they are still hankering after the canal, but once it is demonstrated to them they would take to it.

40,767. Are your Persian wheels worked by bullocks?—Yes, by bullocks, buffaloes and camels.

40,768. Do you not think that one camel is better than two bullocks?—Yes, my orderly uses camels.

40,769. Because two bullocks cannot put their combined force equally together?—But the camel is not much used except in certain parts of the district.

40,770. Perhaps your district does not contain sandy soil for the camels to do ploughing?—In Rewari a certain amount of ploughing is done with camels, but it is not very common.

40,771. Have you in mind any feeder railways which you think could be used for developing your district?—Yes, the people are always asking for a railway to run down the Alwar road.

40,772. Has that been represented?—Yes, I have represented it. The question was dealt with, I think, by some committee which was investigating the possibilities of railways south of Delhi, but I have not heard anything more about it.

40,773. Have you no law here to enable District Boards to levy special cesses, if required, up to a certain limit? Is there any law which authorises you to charge an extra tax?—Not in the form of land revenue.

40,774. What about a special cess?—I cannot tell you.

40,775. With regard to these agricultural graduates you mention, do you not think the best thing would be to give them the lease of a certain amount of land for four or five years? You know the idea?—Yes.

40,776. That has been sanctioned?—Yes.

40,777. Every graduate is to get eighty acres of land for three years. Have you any Crown lands in your district where that scheme could be

worked?—I am afraid they would die of starvation on them; there are no wells, and no irrigation.

40,778. Have you any Crown lands?—Yes.

40,779. Are you going to reclaim land by means of Maconochie's bunds?—That is on land owned by the villagers, not Crown lands.

40,780. Could not Government sink wells on the Crown lands? Most of the Crown lands have occupancy tenants or long-term tenants on them; there is very little Crown land available.

40,781. *Sir Thomas Middleton*: You sum up your note in this sentence: "The regeneration of rural India is just a matter of hard work in intensive propaganda along plain and simple lines, every Department working together and playing into each other's hands." Do you agree that if every Department is to work together there must be some co-ordinating agency in the district? Do you think that throughout India the Collector should regard himself and be regarded as the head of his district for that purpose, as is the case in the Punjab?—Yes. I do not see how else it could be done. This work is so important that whoever does it will in fact be head of the district, so that if the Collector is to remain the head he must do it.

40,782. You mention Rural Community Councils. What is their precise function?—I do not know. There was money in it, so we immediately formed one and I use it entirely as a propaganda agency. All songs, pamphlets, and so on, come before it, and a sub-committee has the songs sung. If they think the villagers will like them and that they will be helpful we have 20,000 copies printed.

40,783. The idea comes from England, where such Councils have recently been introduced to co-ordinate the work of voluntary workers in an area?—Ours is for co-ordinating official workers, but we have many voluntary workers who come in as well. The District Gazette, for example, is edited by a voluntary worker.

40,784. Yes, but your Council does not definitely aim at getting together the non-official workers in your district?—There are about 10 official members; the rest are all non-officials. I get all my advice from non-officials.

40,785. *Professor Gangulee*: Who is the President of that Council?—I am.

40,786. You have an Assistant sanctioned at Rs.250 a month?—Yes. The District Board pays some, the Council pays some and the Scouts pay some.

40,787. How much of that comes from the Education Department?—What the Rural Community Council contributes; most of their revenue comes from the Education Department. I want the other Departments to contribute in proportion to the amount of work we do for them, but that will take time to bring about.

40,788. *Sir Thomas Middleton*: In another paper we have had from the Gurgaon district, the writer says that experience in the district shows the people will not listen to strangers, either official or non-official, so that workers who are to be effective in the district must be residents?—They are very suspicious of outsiders, and the villager is very suspicious of European clothes; he likes to see a man come to him in his own garb.

40,789. He likes the *dhoti*?—They become suspicious of their own children if they take to wearing European clothes. They are very conservative in that way.

40,790. This other paper to which I have referred also says that there has been a very great change in the Gurgaon district; the average villager, who was formerly weak, timid and pessimistic, is now an optimistic fellow?

—I think his outlook has certainly changed in the last six years. We have woken him up a little.

40,791. That result has been secured by six years' intensive propaganda?—Yes, but not six years'. It took me some time to learn the district. The campaign has been developing as ideas occurred to me.

40,792. What I want to get at is this. If the Rural Community Council idea develops, how long will it take before, as in England, the social services are organised and worked by voluntary agencies? How long will your optimistic people take to become useful as voluntary workers?—When Mr. Calvert has got them organised co-operatively.

40,793. How long will that take?—They are so keen that it is only a matter of staff. We have 900 banks; given the staff, I could get 2,000 in a year.

40,794. I was thinking of the danger to the work if there was a transfer of services?—I have been thinking of that for years, and I have been trying to dig so deep that these things will not break down. My hope is co-operation. If we can get better-living societies and cattle-breeding societies and afforestation societies and others in every village, the Co-operative Department is so well organised that whether the Collector is helpful, hostile or neutral the work will still go on independent of him.

40,795. It is not yet in that position?—Where there is co-operative organisation it is.

40,796. Have you been successful in getting the villagers to do anything for the improvement of their roads as well as of their village sites?—No, I have not tried, except that where a road is very bad and I am told there is no money to mend it I announce that I am going there in my car, and then they put it right.

40,797. How is the money found for the repair of it?—The villagers do it themselves.

40,798. They can do it themselves when put to it?—Yes.

40,799. Your method of making them do it is a very simple one. Do you think one might systematise such work by entrusting the care of village road to panchayats or groups of panchayats?—You would have the anti-*Begár* people after you if you did that, because undoubtedly the village roads if they are mended at all are mended by *Begár*, by the menials of the villagers.

40,800 You have not succeeded in instilling into Gurgaon cultivators the dignity of labour to such an extent that they will repair their own roads?—Yes, I think if a village had no menials the villagers would do it themselves. I would like to see the menials reinstated as human beings somewhere; I think they drag the villagers down.

40,801. You mention the need for research into quick fences, which indicates that you attach importance to the effect of enclosure?—Yes.

40,802. The real obstacle to enclosure at the present time is fragmentation of holdings?—Yes.

40,803. Do you realise that if that difficulty were solved enclosure would do a very great deal to improve the economic position of the Indian villager?—I do.

40,804. Not only by enabling his boys to get to school instead of herding cattle, but by preserving his crops?—All crops within so many yards of the road are wasted owing to the cattle; an enormous amount of damage is done.

40,805. Is there any enclosure in your district?—In one tract the villagers put earthen banks covered with thorn all round their well crops. That is a very effective form of enclosure.

40,806. You have no hedges in the Gurgaon district?—That is the only kind, a bank of earth with thorns on top.

40,807. To what extent has the village schoolmaster assisted you in your uplift work?—Those who have been through our rural school have learned the whole gospel, and some of them are extraordinarily good. I saw what one man had done; his village was so clean I would not mind living in it myself.

40,808. Was he a member of the agricultural classes?—Yes, I think he was a Rajput.

40,809. Do you think that if these schoolmasters come (as they mainly do to-day) from the non-agricultural classes they can be trained to assist in your work?—Yes. I have no prejudice against the non-agriculturist.

40,810. Do you think as a body they would make helpful workers if trained?—If trained, yes. The trouble is, of course, that the villager is suspicious of them. I am not, but the villagers are; they say "After all, he is not a zamindar." Such a man starts with a terrible handicap.

40,811. If you have not now got the pandit, I wondered whether the schoolmaster might take his place?—Yes, easily. We hope in time every teacher will be trained in this school, and then he will be a centre for all our work.

40,812. A Director of Local Uplift would not be of much use unless you had a strong local organisation in your district?—I want a strong local organisation.

40,813. Do you think the appointment of a Director would create a strong local organisation if the Collector did not himself take the initiative?—It would take time to bring it to the position of the Co-operative Department, which is independent of the Collector, but it could be done. It does not matter whether the Collector helps or hinders the banks; they go on. If Government were behind this work the Director could go ahead, but he would do better with the help of the Collector.

40,814. From some of your evidence it occurred to me that the Director might be simply another member of the distant Lahore Government and that he would not know what was going on in the districts?—Then he would not be a Director. He would be no use unless he was in touch with village life.

40,815. What are the duties of the Pasture Officer?—There is one such officer for the whole of the Punjab.

40,816. You have been very successful in getting the villagers to castrate inferior bulls; was there much objection when you started?—Yes, immense.

40,817. After what period of time did it begin to break down, after two or three years?—I should think about three years; it took a tremendous lot of time and trouble, but I think they now realise that whoever supports bad bulls is supporting the butcher. The offspring of no good bull will ever go to the slaughterhouse.

40,818. How were the objections removed?—By propaganda, steadily explaining it to them.

40,819. Did you make any suggestion to them that they were supporting the butcher?—Yes, I have told Brahmins: "If you keep that bad bull the progeny of that bull will go to the slaughterhouse some time; they will be useless for milk or for the plough, you will sell them and ultimately they will get to the slaughterhouse."

Mr. F. L. Brayne.

40,820. It was not a case of your saying to them that you were coming round in your motor car and you must find all bad bulls castrated?—No, I did not ride roughshod over them like that; I knew what I was up against and I went slowly; I let that idea soak in for years. The change that took place was very great. The first year I was there they would not take Hissar bulls, so we started a scheme by which local young stock was sent to Hissar and then returned when it was fit for work, for covering purposes. The propaganda in the meanwhile had had such an effect, that when these bulls came back we had to castrate them and sell them as bullocks.

40,821. I think you emphasise the point that *taccavi* should only be freely used in time of need?—No, I have not said that.

40,822. You say: "*Taccavi* should be freely poured into the Co-operative Central Banks, Unions and village societies to finance agriculture in times of need, that is to say, whenever the Registrar is satisfied that it should be lent to finance development"?—Yes; I thought you meant in famine times.

40,823. When there is need for development?—Yes, whenever the banks are short of money I should like them to get *taccavi*, if the Bank Department approves of it.

40,824. I think you take the view that all mortgages should be terminable?—They should be for a fixed period, yes, not perpetual.

40,825. You would no doubt provide a sinking fund to amortise the mortgages?—They would amortise themselves.

40,826. If they are terminable the lender will see that the sinking fund is provided for?—He only gets the land for so many years, and after that it is handed back free of encumbrances.

40,827. *Mr. Calvert*: You mean a usufructuary mortgage, a mortgage in possession?—Yes. The ordinary zamindar's mortgage apparently is eternal; he has lent an unknown sum in the distant past and it is practically his land now.

40,828. *Sir Thomas Middleton*: But in addition to the interest on that mortgage, there would have to be a sinking fund?—Yes.

40,829. The lender would see to that?—Yes, I thought you meant the Government was to provide a sinking fund.

40,830. No?—The shorter the term the heavier the sinking fund and the lower the man's credit; what is the good of giving him too much credit?

40,831. What is your idea of the length of time for a terminable mortgage?—I think ten or fifteen years; I certainly would not go beyond fifteen years.

40,832. It becomes rather a steep sinking fund then?—No, the man gets less credit, that is all; I want to reduce his credit.

40,833. I was going to suggest a period of twenty years. That is a generation; that is to say, if a man mortgages, he will not see his land again.

40,834. In regard to the consolidation of fragmented holdings, you would be satisfied if the owners of a majority of the cultivated land agreed; that is to say, if the owners of 51 per cent. of the cultivated land were in favour, you would agree to consolidation?—Yes; it is the foundation of everything.

40,835. A bare majority?—Yes. I cannot imagine 49 per cent. disapproving.

40,836. No, but it might be a case of there being two or three large owners in the village owning a little over half the land, and they might

try to impose their wishes on the rest of the villagers; that is what you contemplate?—Yes; I want to make it as easy as possible to consolidate.

40,837. With reference to pasture schemes, you want a remission of land revenue for pastures which are properly established and maintained?—Yes.

40,838. I think I have seen only a small part of the Gurgaon District, going by road to Karnal, but I saw no pastures?—You do not go through Gurgaon there. There are no pastures; I want to start them; we might have a dozen cultivators joining together for the purpose.

40,839. Could you do that without enclosing your pasture?—Part of the proper maintenance would consist in enclosing.

40,840. Enclosed pasture and limited grazing?—Yes, that is all part of the maintenance. Mr. Branford, the Punjab Cattle Expert, came on a short tour with me and looked at the sort of ground; he is very much in favour of that sort of thing; he thinks we can breed on those terms.

40,841. With regard to what you say as to the Cattle Breeding Department, is it cramped because there is not enough money given to it?—I do not think the Agricultural Department really understands this cattle problem.

40,842. Surely it is part of the business of an agriculturist to understand cattle?—You would think so.

40,843. That is one thing at least which they do not understand in England?—At Gurgaon we have got 600 stud bulls; I believe we have the biggest breeding establishment in the world; you would think they would pour veterinary people on to us to stop epidemics, but we keep running short of serum, and we have not got the men to inoculate nor have we got sufficient staff to inspect these bulls. I do not believe any rancher in the Argentine has got 600 stud bulls, but we cannot get Veterinary Assistants and we cannot get serum. I believe we have got every known epidemic raging in the Gurgaon district; we are surrounded by Indian States who have no veterinary arrangements at all. They have huge fairs in which they make a great income, none of which they spend on cattle breeding, on bulls or on cattle hospitals; they simply disseminate disease.

40,844. I take it from what you say that in your breeding in the Gurgaon district you are paying attention to the cow stock?—We are trying to, yes.

40,845. I think you said there was a neglect of the females, both human and bovine?—Yes. We have eight Veterinary Assistants for 2,400 square miles for disease inspection of cattle and epidemics; what can they do?

40,846. Would you agree that it is no use sending out good bulls if no attention whatever is paid to the cows and calves? The stock simply dies out?—They keep them alive, but the cow is not as well developed as she should be.

40,847. Nor is the calf that you want to get?—Yes, the next generation is not as well developed, but we are making a vast improvement in our cattle.

40,848. You suggest the giving of awards in connection with cattle breeding so that, as in England, cattle breeding may become an honourable hobby. Have you seen any indication at all of the richer zamindars taking up cattle breeding as a hobby?—One man who happens to be a Member of the Legislative Council, Rao Bahadur Balbir Singh, keeps a herd of good cows. I should like everyone, from the highest in the land, to have a pedigree herd.

40,849. You draw attention to the absence of literature suitable for villagers; have you formed any idea as to how that literature could be provided? Who would write?—I fancy if you offered money the writers would appear. If you guaranteed a sale of Rs.20,000 for a good book, I think writers

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would appear; I do not know; I do not know how writers are produced in any country.

40,850. There is no market at present for that sort of literature?—No.

40,851. We are faced with the position that even if you produced literacy in India there is nothing for the boys to read?—Yes, that is why they are not keen on the schools: there is nothing to read; if they had something corresponding to *Robinson Crusoe* and *Alice in Wonderland* suitable for village life they would all want to learn to read.

40,852. I was wondering whether you yourself have tried to write anything?—I have published some stuff, but I am afraid this uplift literature is rather dull reading; I should like to see something more amusing than I can produce.

40,853. *Sir Ganga Ram*: What has become of the salt works in your district?—Salt can be produced and imported cheaper than it can be made there, and so the works died a natural death, and had to be closed down. I worked it out to see whether I could re-introduce the industry, and I found it would have to be subsidised by Government to an enormous extent to enable anybody to get a living out of it.

40,854. *Sir Thomas Middleton*: At what price can cultivators buy salt in your district; do you happen to know?—No.

40,855. *Professor Ganguler*: Have you any organised non-official agency in your district whose co-operation might be profitable to you; I am not thinking of individuals, but of an organised non-official agency?—I do not think so.

(The witness withdrew.)

APPENDIX.

Progress of the Rural Uplift Scheme in Gurgaon.

	1920-21.	*1926-27.*
Approved stud bulls	8	665
Castration of bad stud bulls ...	—	472
Hissars heifers	—	123
Rams	—	125
Stallions	5	16
Iron ploughs	—	1,337
Ploughing matches	—	All *tehsils*, district and divisional championships.
Cattle fairs	2	11
Persian wheels	—	600
Re-afforestation of hills	1,325 acres.	6,780 acres.
Area under 8-A wheat	—	15,000 ,,
Area under *Rosy Batla* cotton ...	—	25,000 ,,
Field rats poisoned	—	417 villages (2,50,000 acres).
Porcupines poisoned...	—	80 villages (186 burrows closed).
Horse and cattle show and agricultural exhibition, etc.	—	Palwal.
Banks	153	900
Members	3,303	19,000
Working capital	Rs. 1,36,224	Rs. 24,00,000
Working capital, per society ...	Rs. 900	Rs. 2,704

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	1920-21.	1926-27.
Banks—contd.		
Owned capital	Rs. 14,000	Rs. 4,00,000
Owned capital, per society ...	Rs. 92	Rs. 508
Central Banks and Unions ...	1	4
Health.		
Hospitals	11	23
Patients	1,27,000	2,58,000
Health centres	—	7 (urban 3, rural 4).
Health visitors	—	4
Vaccinations	12,926	42,000
Plague inoculations	—	4 epidemics 2,66,850 last epidemic 1,21,555
Pits 6 feet deep for village refuse, manure, etc.	—	30,000 Heaps of rubbish, ashes, etc removed in 1,250 villages.
Domestic school	—	Started.
Proper arrangements in drinking wells	—	4 wells working, many under order
Education.		
High schools	2	4 (2 added by public subscription).
Pupils	10,839	23,478
Girls in boys' schools	—	850
Red Cross and St. John ambulance branches	—	44
Night schools	—	140
School of Rural Economy... ...	—	Started.
Propaganda.		
English pamphlets...	—	10,520
Vernacular posters	—	58,000
Vernacular leaflets	—	77,500
Vernacular pamphlets	—	4,000
Magic lanterns	—	16
District Gazette	—	(weekly) 1,800 issue.
General	—	One Territorial Battalion 11/14th Punjab Regiment (Gurgaon Battalion).
Marriage registers	—	One tribe of 125,000 complete.
Kaj	—	Very rare now.
Dungcake making	—	Some villages stopped altogether — reduction in many hundreds.
Bullock-driven flour mills ...	—	A few only working, but several hundred indented for—not yet delivered.

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SARDAR MUHAMMED NAWAZ KHAN, I.A.R.O., M.L.A., of Kot-Fateh-Khan, Attock District.

Replies to the Questionnaire.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(a) (i) Poverty due to carelessness and bad customs, easy credit.

(ii) Moneylenders, co-operative credit societies, landholders.

(iii) Poverty.

(b) Yes, but laws require to be administered, and that is never going to happen in the Punjab till the judiciary of the Province is recruited from among agriculturists.

(c) Yes.

QUESTION 7.- FRAGMENTATION OF HOLDINGS. (a) The only remedy that I can think of is compulsory consolidation of holdings.

(b) Ignorance and selfishness which can only be overcome by education and legislation.

(c) Yes.

Oral Evidence.

40,856. *Sir Henry Lawrence*: Sardar Nawaz Khan, you have been good enough to send us a brief note of your evidence. Would you give us as account of what it is you wish to say?—I do not think I can give you any account in addition to the two questions which I have answered.

40,857. I take it from your answer to Question 6 (*b*) that you are not satisfied with the present administration of justice. Is it civil justice or criminal justice?—Civil justice.

40,858. What is the matter on which you consider improvement is necessary?—I have submitted it in my note. If more people were recruited from among the agriculturists, they would be able to understand the conditions better than the people who come from towns. I do not mean any slur on the gentlemen who are now administering justice.

40,859. Is it lack of understanding or lack of sympathy?—Lack of understanding.

40,860. Is any advance being made towards recruitment from agriculturists?—I am not quite sure about it; I do not know.

40,861. You yourself are a landlord, zamindar of Attock, are you?—Yes.

40,862. Do you live on your land?—Yes.

40,863. Do you cultivate your land?—I do not cultivate, my tenants cultivate the land.

40,864. *Mr. Calvert*: I understand you are very keen on agricultural improvement?—I think all zamindars ought to be.

40,865. You are also in charge of all the co-operative societies on your estate?—Yes.

40,866. How many societies are there?—About 50.

40,867. You are Honorary Assistant Registrar for your estate?—Yes.

40,868. I believe you once tried to get rid of all debts to moneylenders by advancing money to your tenants?—Yes.

40,869. What happened to that experiment?—In the beginning it seemed to work well; but after some time I found that some of the tenants were trying to cheat me by obtaining money from me saying that they were in debt though actually they were not in debt, so I stopped that.

40,870. Were you advancing money free of interest?—Yes. I stopped giving them the money and I started these co-operative societies.

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40,870. Were you advancing money free of interest?—Yes. I stopped giving them the money and I started these co-operative societies.

40,871. You *only lend now* through co-operative societies?—Yes.

40,872. Is there on your estate a union of the co-operative societies?—Yes.

40,873. Do you work through that union?—Yes.

40,874. Could you tell us what your experience has been with new types of seed?—The tenants in that part are very *conservative*; they do *not* take anything which is new; but I *presume that*, if these experiments are carried on for some time, ultimately *they* will begin to see the benefit of the *different* kinds of seed and start sowing them.

40,875. What *kind of seed did* you try to introduce?—Wheat, Punjab 11. That is the *only* seed we have tried.

40,876. Does it give a *better* yield than the local variety?—Yes.

40,877. Is it becoming popular?—Yes; they are taking to it now.

40,878. That is the only *kind* of new seed you have so far introduced?—Yes.

40,879. Have you tried cattle improvement?—Yes.

40,880. What is it you have done there?—There again I deal through the co-operative societies. I sell the young cattle to *the union* at cheap rates on the condition that members only will buy and sell among themselves and that they should not be sold to outsiders. That helps us to keep good *cattle* in the societies; otherwise people there are in the habit of *selling* good cattle and *ploughing the land with bad* cattle.

40,881. At present you are trying to improve the quality of the cattle on the estate?—Yes.

40,882. Is that doing well?—Yes.

40,883. Have you *done anything to improve* the sheep?—Yes; we have tried two different kinds of sheep; one is what is known in our parts as the Turkish and the other is the Merino sheep. The wool of *the latter* is much better than that of *the ordinary type*, though the people there like the former better.

40,884. Is a distinct improvement taking place?—Yes.

40,885. One point which we have had *constantly before us* is as to why *big landholders do not* take more interest in agriculture. Could you explain why your neighbours do not take *more* interest in agriculture?—In my part of the country quite a lot *depends on* the Deputy Commissioner. If he happens to take one view, *all* the landowners are in a way compelled by circumstances to take *the* same view, whether they believe in *it or* not. Of course, some Deputy Commissioners are very good; on the other hand you find *some who have* certain ideas of their own, and if anybody else has any other ideas, then they do not encourage *him*. They think their ideas are better than his and therefore he *is required* to conform to them. Then again I think that of late too much importance has been attached to politics; I do not mean to say that politics does not deserve any attention at all, but too much importance has been given to those who curse the administration, and all sorts of facilities have been provided and different political organisations have been formed to encourage politicians, with the result that the landowners have *been left out* in the cold. I think these are the two chief difficulties in the way of those landowners who want to take interest, and I think there are quite a lot nowadays who want to interest themselves in agriculture. Of course there are some who are lazy or who are in debt, in which case they cannot do much to help their tenants.

40,886. You saw *this Horse Show in Delhi*?—Yes.

40,887. Do you think that if the same amount of attention were devoted to cattle-breeding as is devoted to horse-breeding, there would be good results?—Yes.

Sardar Muhammed Nawaz Khan.

40,888. Have you found the Agricultural Department of much use to you in Attock?—One hardly sees any of those people; at least I have never seen anyone there.

40,889. Do you find the Veterinary Department useful to you?—Yes, they do more work than the Agricultural Department.

40,890. There has been in your district a big experiment in silos. Can you give us any evidence as to the result of that experiment?—No.

40,891. We have just heard from the last witness that big landlords take too *much from* the tenant. Is it the custom on your side to take any cesses above the fixed rent?—There are certain cesses which are put down in the revenue papers, but most of the landlords do not collect these cesses, because the rents are supposed to be quite enough, and also there is a scarcity of tenants. If you begin to take all the rent you are entitled to, you will probably find that all the tenants will go away.

40,892. What is the state of the ordinary primary education on your estate?—We have got nine schools there.

40,893. Are they well attended?—Yes.

40,894. Do you think the time has arrived to start compulsory education in that part of the Province?—I do not think that it will work in my part of the country.

40,895. Do you mean the people are too backward or what?—No. Supposing there is a boy of ten years of age, he is usually sent to look after the cattle. When he comes back to the house and there is somebody else to take his place, only then he goes to the school. If there is compulsory primary education then I do not know what will happen, because in that case the people would be required to employ servants to do the work which is now being done by children.

40,896. Have you tried any improved ploughs?—Yes, the Raja plough and the harrow.

40,897. Have you tried the Meston plough?—No.

40,898. What is your experience?—I think the Raja plough is quite good for those parts, but it is rather heavy. The cattle are not strong enough to pull it and so the people do not take to it, but if there were better cattle then I think it would be quite useful.

40,899. Have you tried artificial manures of any kind?—No.

40,900. Have you tried fruit growing?—Yes.

40,901. In fruit-growing do you get any help at all from anyone?—No.

40,902. *Mr. Kamat*: You are in favour of compulsory consolidation of holdings?—Yes.

40,903. You say that in the Punjab, where we are told that the co-operative movement has been successful, compulsory consolidation is necessary?—Yes, my reason is that with the co-operative movement you will be able to consolidate all the holdings throughout the Province within the next sixty years, but if you were to have some sort of legislation then you would be able to do it immediately, and the sooner it is done the better.

40,904. You think that consolidation by means of the co-operative movement will be a very slow process?—It will take some time.

40,905. Sixty years?—Yes, for it to spread throughout the Province. Some districts will take to it sooner than others; for instance my district will take to it I think, in about thirty years.

40,906. *Professor Gangulee*: You say there is a great deal of scope for a fruit growing industry?—No; Mr. Calvert wanted to know whether I got any help from anybody in fruit growing, and I said "No."

40,907. Is there any scope for fruit growing?—I think that fruit growing requires a lot of water and there is not much water in my district; it is all *barani*.

40,908. *Sir Henry Lawrence*: What class of tenant do you deal with?—They are mostly Awans.

40,909. Do they all belong to one tribe?—No; the majority of them however do belong to one tribe.

40,910. Do you belong to that tribe?—No, I belong to a different tribe which is called the Gheba (Mughal) tribe.

(The witness withdrew.)

RAO BAHADUR CHAUDHRI LAL CHAND, President, State Council, Bharatpur.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—Ever since Agriculture became a provincial subject, the Government of India has not been giving enough guidance in the matter of research, and consequently unity of policy of programme has been sacrificed and contiguous provinces under similar conditions are liable to have different policies. Research work done so far by provinces should be codified, and an organisation to bring about better co-operation and co-ordination between different provinces should be brought into existence.

QUESTION 2.—AGRICULTURAL EDUCATION.—Government has imparted some education in agriculture but so far very little education has been given to the agriculturist. The man who actually wields the plough has not been sufficiently approached. In India we look upon education as a means to get into Government Service. We cannot change the mentality in a day and so long as it is not made compulsory for certain departments to recruit men with agricultural education, the position will not improve. Recruitment to Co-operative Department, Veterinary Department and allied services like the Court of Wards, Revenue and Canal Departments and to the village schools, if confined to those who possess the agricultural diploma or degree as the case may be will give stimulus to the education of agriculturists. The market value for a youth who has received agricultural education should be raised and half the work of agricultural education will be finished. Higher services should also be recruited from agricultural graduates. The rate at which the arts side of education has progressed under private enterprise is sufficient to convince us of the rapid stride agricultural education will take, if the above suggestion is accepted.

Agricultural education at present is very meagre, and does not attract the best brains even from among agriculturists. As remarked above it should be made attractive.

(xii) Adult education in rural tracts is another problem and the following methods will prove useful:—

1. Night Schools for adults wherein simple education in the form of stories &c., should be imparted.
2. Folk Schools of Denmark should be copied in rural areas; and
3. Propaganda.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) Demonstration farms and demonstration plots seem to have been successful in this respect. But the demonstration farm should demonstrate that with equal labour we could produce more than what the agriculturist does, otherwise, we will only be demonstrating that agriculture is not a paying profession and should be given up. There should be one such farm at headquarters of each *tehsil*.

(*b*) Increase their number and do intensive propaganda.

(*c*) Select a particular area (a *tehsil* or a district) for intensive work not only in agriculture but also in veterinary and co-operation and in a few years this area will serve as a demonstration plot not only to induce individual cultivators, but also to attract private enterprise in this line. No amount of preaching will serve better than this example.

(*d*) Cinema shows with agricultural co-operative and veterinary slides should be given very frequently on the occasion of cattle fairs and *tehsil* co-operative conferences, as attempted in some cases in the Punjab.

QUESTION 4.—ADMINISTRATION. (*c*) (i) In Agricultural Service a whole army of workers is needed to carry the message of the research worker to the cultivators. The same may be said about Veterinary also. There is too much of overlapping in Veterinary Department. This will be apparent from a comparison with the human medical service as shown below:—

Medical.	*Veterinary.*
Minister.	Minister.
Inspector General.	Financial Commissioner for Development.
Civil Surgeon.	Director of Agriculture.
Assistant or Sub-Assistant Surgeon.	Chief Superintendent, Civil Veterinary Department.
	Superintendent, Do.
	Dy.-Superintendent, Do.
	Inspector, Do.
	Veterinary Assistant.

Thus whereas in human agency there are two steps only between the man who deals with the people direct and the Minister, we have as many as six sets of officers intervening between the Minister and the Veterinary Assistant. The pay and prospects of the Subordinate Services should be made more attractive in order to induce better brains to take to these services.

(ii) *Railways.*—The schedule of rates for marketing seed and fodder should be revised. Railway Inspectors for goods should be drawn from educated retired Military Officers to stop corruption and should be posted on all important stations.

(iii) *Roads.*—Communications from village to village are in a hopeless condition. Legislation will be necessary first to straighten these roads and then steps should be taken to widen and consolidate them. In not a few places these village roads serve as drains also and are impassable during monsoons.

(iv) The Meteorological Department should be brought into touch with the rural people. All important rural papers particularly vernacular ones should be supplied with up-to-date information.

(v) The Post office is a great help in imparting education and bringing out of the way places into touch with the market and the Press. Government should lay down a policy of extension into rural areas and in cases where people or co-operative societies are prepared to guarantee against losses and to meet expenses, a post office should not be refused.

(vi) Canal telegraph offices should be thrown open to the public and the policy should be like the one indicated in respect to the post offices.

QUESTION 5.—FINANCE.—(*a*) For short term credit, co-operative credit societies, with constant supervision, is the only remedy. It is no use aiming at the ideal of members managing their own affairs on the very first day as that is an impossibility. For long term credit, mortgage banks should be started. In Punjab at least this branch, if transferred to the Co-operative Department, will work better, as they are more in touch with the financial position and needs of the cultivators than the revenue staff. I remember one case where Government was anxious to help people by advancing *taccavi*. About a lakh was advanced on loan at 9 to 12 per cent. per annum by the co-operative staff, but the Tahsildar actually reported to the higher authorities that people were not prepared to take *taccavi* at 6 or 7 per cent., and it was not before the higher authorities took severe action and guaranteed against corruption that the cultivators availed themselves of this *taccavi*.

QUESTION 6.—AGRICULTURAL INDETEDNESS.—(*a*) The following are the main causes:—(i) The uncertainty of crops; (ii) heavy cattle mortality; (iii) litigation; (iv) expenditure on ornaments and expensive ceremonial customs; (v) heavy rate of interest; and (vi) heavy burden of land revenue on owners of small holdings.

NOTE.—Unlike income-tax, no one, however small his income may be, is exempt, and there is no graduated system of assessment.

(*b*) The following measures will help:—

(1) Co-operative societies should be opened not for demonstration, but in order to bring the *whole* of the rural population within their fold.

(2) Recruitment of judges and munsifs from among the agriculturists.

(3) Moneylending profession should be reformed on such lines by legislation as there may be fairness and justice in dealings and Usurious Loans Act should be made more effective.

(4) Redemption of Mortgages Act should be passed everywhere fixing a percentage of principal beyond which interest should not be allowed in any case.

(5) The Alienation of Land Act has done good in the Punjab. Similar legislation should be provided everywhere. But care should be taken that big zamindars should not devour the smaller ones. In the Punjab this evil has crept in, and steps should be taken to amend the Alienation of Land Act so that no one may sell or mortgage his land if it is below the average of an economic holding. The prohibition should apply to all purchasers, agriculturists or non-agriculturists.

(*c*) Control of credit, &c., should be left to co-operative societies. Yes, non-terminable mortgages should be prohibited.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—Steps taken in the Punjab in consolidating holdings have proved very successful, and must be copied everywhere. As the preliminary stage has been passed the Government should spread this movement very rapidly with some expert at its head for the whole of India. The method known as the Calvert Scheme of consolidation should be copied in every Province.

QUESTION 8.—IRRIGATION.—(*a*) The Government has paid practically no attention to well irrigation and pond or tank irrigation in the Punjab, and the Irrigation Department is only a canal irrigation department. In all places where water level has come up canal irrigation should give place to well irrigation, and canal water thus saved should be extended further into *barani* tracts.

For south-east Punjab (Rohtak, Karnal, Gurgaon and Hissar districts) some provision for better irrigation should be made. This can be done by taking in hand the project called the Bhakra dam scheme. Another alternative is to divert Ganges water into the Jamna to supplement its waters. The level of the soil favours this scheme.

Rao Bahadur Chaudhri Lal Chand.

QUESTION 9.—SOILS.—Improvement of soils or reclamation of alkali land is a pious wish, no doubt. But its turn should come after all the good land has received irrigation. In a country where waste land could be had for the asking (from Muttra down to the Bombay Presidency) money should be spent on making use of the best that nature has provided for us, and which is lying waste for want of men, control of water or some other manageable cause.

QUESTION 15.—VETERINARY.—(*b*) (i) Yes, and the system is working well.

(ii) The need for the expansion is not being adequately met. I suggest there should be one dispensary in an area of five miles radius or on some basis of population, except in areas which are very thinly populated.

(iii) I see no special difficulty in the present system, and hence do not advocate the transfer of control to provincial authority.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) (i) I suggest that local breeds may be improved by starting cattle-breeding societies and by opening Government cattle-breeding farms in areas of famous breed, just like Hariana of Rohtak, Sahiwal of Montgomery, Dhani of Western Punjab and Thar-Parkar of Sindh, &c. In improving these breeds dual purpose should be kept in view, i.e., there should be improvement both in milking and draft qualities of these animals. As far as possible efforts should be made to keep these breeds pure.

QUESTION 20.—MARKETING.—I suggest that Government or local bodies should stamp weights and measures, and that these alone should be used in all markets and the using of any other measures should be made unlawful. These weights and measures should be checked by some authority after some fixed period.

QUESTION 22.—CO-OPERATION.—(*a*) (i) I think, to encourage the growth of the co-operative movement, sufficiently well-trained staff may be given to this department. Other Provinces should follow the example of the Punjab. In order to attract good brains and to keep up the present efficiency of the Punjab, the pay of an Inspector should not be less than that of a Tahsildar, and an Assistant Registrar should be paid not less than an Extra Assistant Commissioner. I also suggest that the payment of revenue in those villages where there is a co-operative society should be made through the co-operative society, as is being done in a few cases in Rewari Tahsil. Besides the above, Government should supply the staff needed for making new schemes successful and give financial help in the form of cheap loans to new forms of co-operative institutions, such as mortgage banks and building societies.

(*c*) I suggest that if three-fourths of the people want to have co-operative schemes such as co-operative irrigation, co-operative fencing and co-operative consolidation of holdings, the remaining one-fourth should be compelled to join for the common benefit of all. I am in favour of other necessary legislation with the advice of experts of the type of Mr. Calvert.

(*d*) I think A Class societies have achieved their object, and B Class are coming up to it. In writing the above lines, I have only the Punjab in view.

Oral Evidence.

40,911. *Sir Henry Lawrence*: Rao Bahadur Chaudhri Lal Chand, you are President of the State Council, Bharatpur?—Yes.

40,912. And you have been a Minister in the Punjab Government?—Yes.

40,913. We have read your note with much interest. What is the principal point to which you attach most importance and which you wish us to consider?—In the first place, I would have intensive propaganda work both in agriculture (including veterinary) as well as co-operation. Each department should select particular areas to carry on their work; for instance,

the Department of Agriculture should see that nothing but the best seed is used by the cultivators. Then the Veterinary Department should see that the best bulls are made available; and similarly, the Co-operative Department should see that as many of the cultivators become members of the co-operative societies as possible.

40,914. Were you Minister for Agriculture in the Punjab?—Yes.

40,915. And also for Co-operation?—Yes.

40,916. You belong to the cultivating community?—Yes, I am a Jat.

40,917. You have heard the evidence given before the Commission by the Deputy Commissioner of Gurgaon?—Yes.

40,918. I understand that a large section of the population with which he dealt with belonged to your community? Are you acquainted with the improvement he has told us has taken place in that district?—Yes.

40,919. Improvement in the welfare of the people?—Yes; I have been to Gurgaon.

40,920. Do you agree with his description of the condition of the people, with their earnest seeking after higher things now?—Yes, there is a change no doubt, but there is one fear, and that is that when Mr. Brayne leaves they will go back to the old conditions.

40,921. You do not think that it has taken a hold upon the Jats there?—That will certainly take time.

40,922. How much time would it take: about a generation?—No, not quite a generation, but with some education of a better standard they will be able to take to it after ten years; they require some guiding hand for that period at least.

40,923. Supposing a District or Local Board is in financial difficulties and has to spend its money very cautiously, which would you place first in order of merit, roads or schools?—I think both are very necessary; you cannot put one in front of the other.

40,924. I gather from your note that communications from village to village are in a very hopeless condition?—Yes, the roads are more or less like drains in the rainy season. If I remember aright, Mr. Calvert did some work in connection with village roads. The Punjab Government set apart about Rs.30,000 for that purpose in 1924.

40,925. Are the village roads the property of the State or of the zamindars?—No; the majority of the people here are peasant proprietors; in the south-east there are very few big zamindars, so the land in question belongs to the proprietory body.

40,926. In another Province we were told that nothing could be done with these village roads until the actual land through which these roads passed was bought from the zamindars. Is that the position with you here?—Here the land is the common village land, and we could have legislation to the effect that all the roads should be the property of the District Board. I mean to say that we can have all these roads which lead from one village to another made the property of the District Board.

40,927. You can spend money on their improvement without compensating any person, can you?—Yes, if we introduce legislation.

40,928. You require legislation?—Yes.

40,929. Is it proposed to pass such legislation?—It has never been proposed to pass such legislation, but it is necessary that such legislation should be passed.

40,930. Would you advocate that such legislation should be passed?—Yes; the Municipalities give us a parallel. Here every street as defined by law is vested in the Municipal Committee. Similarly roads leading from one village

to another may vest in the hands of the District Board by means of legislation. And I think that so far as the Punjab is concerned if such a proposal were made it would be carried. The zamindar members who command the largest majority will probably favour this idea.

40,931. So far as you are aware is there any such proposal pending the consideration of Government?—No.

40,932. *Mr. Calvert*: When you became Minister you found that the arbitration societies had been closed down?—Yes.

40,933. By order of your predecessor?—Yes.

40,934. Did you try to revive them?—I do not remember what action was taken, but certainly I did not like the idea, and the majority of the zamindar members resented the order very much, at any rate those who were concerned with them.

40,935. Those societies were becoming popular, were they?—Yes, very popular. They were doing very useful work.

40,936. *Sir Henry Lawrence*: Stopping litigation?—Yes.

40,937. *Professor Gangulee*: Why was it stopped by the Minister?—I do not know what the reasons were; Mr. Calvert may probably know. For one thing the Minister was a non-agriculturist and a townsman.

40,938. *Mr. Calvert*: Could you suggest to us how the Usurious Loans Act could be more widely enforced?—You require a sympathetic staff to work it, that is the first thing. Just at present in the judiciary of the Province there are very few zamindars or agriculturists. Unless you recruit a fair proportion from amongst the zamindar and agricultural classes you cannot improve things.

40,939. Would you like to see the Redemption of Mortgages Act amended so as to apply it to a larger number of cases?—Certainly.

40,940. At present it applies only to petty mortgages?—Yes.

40,941. Do you know of cases in which the mortgagor is prevented by the mortgagee from redeeming his land?—There are any number of such cases.

40,942. Would you like to suggest any method whereby the bigger landowners could be prevented from swallowing up the smaller ones?—That is a great problem in the Punjab, and the sooner it is taken in hand the better. I would have an economic inquiry made to find out what is the size of an economic holding, just sufficient to support a family of six persons, and also to notify for each district the size of the economic holding, below which nobody should be allowed to sell his property, whether to a zamindar or to a non-zamindar. This can be done by amending the Land Alienation Act. The bigger zamindars will not like this.

40,943. Can you suggest any means whereby the improvement of the land could be encouraged by sinking of wells or by similar measures?—Yes; there are, as I have said in my note, tracts where the canal water is no longer needed, as the water level has risen up. Government should undertake the sinking of wells and charge *abiana* from the people and extend water so saved into *barani* tracts.

40,944. Government should sink the wells and recover by a water cess?—Yes.

40,945. You favour the use of stamped weights and measures?—Yes.

40,946. Do you think that could be successfully imposed on the Province?—I think so. Corruption is greatest in the ginning factories and mills where cotton is bought and in the *mandis*. It should not be difficult to have a staff to check it.

40,947. I was thinking of the weights and measures used in shops, and so on?—They could be checked by the co-operative or revenue staff in the villages.

40,948. You think it could be done?—Yes. I have known cases where in the same shop one set of weights and measures has been kept for buying and another for selling.

40,949. I think you were Chairman of the District Board at Rohtak?—I was Vice-Chairman for six or seven years.

40,950 Did you find the people there willing to pay for increased amenities? Was a local cess raised in your time?—Yes, and there was no difficulty in getting it sanctioned. Later on, however, the same Board resented it, and there was some trouble. It may be the members fell out amongst themselves. In my time, however, I never had any difficulty in getting them to agree to it; there was difficulty only on one occasion, when I wanted to have a sanitary staff appointed, and they objected, not on the ground of expense, but because they said it would mean so many more mouths to be fed when touring in villages.

40,951. I believe Rohtak has the largest mileage of metalled roads of any district in the Province?—Yes.

40,952. Are those roads appreciated?—Yes, very much. The zamindars have greatly benefited by them.

40,953. Do you think they would be prepared to pay for an extension of those roads?—Yes. In my time they were very eager to have their own tramways, and for that they were willing to pay a certain cess. I am not sure whether they will be prepared to pay that now, because 24 pies in the rupee is a fairly large amount, and they may not care for an extra cess; but they highly appreciate the existence of roads, and when the roads got out of order they resented it very much. There have been cases where they have refused grants for building schools so as to have more money for roads.

40,954. Rohtak is a large cotton-growing district?—Yes, fairly large.

40,955. Are they trying any new cottons there?—Bhatla cotton is being tried and it is fairly successful.

40,956. Is there any difficulty in marketing that cotton?—I do not know.

40,957. Is wetting of the cotton practised by the growers?—Yes. Someone told me that when bringing the cotton to market they sprinkle a little water over it.

40,958. The growers, not the ginners?—The ginners do it too.

40,959. Who does it the most?—I think the growers have learnt it from the ginners.

40,960. Rohtak is also a large cane-growing district?—Yes.

40,961. Are any improved canes being tried there?—Coimbatore 213 is being tried, I believe, successfully.

40,962. You were also President for many years of the Co-operative Central Bank at Rohtak?—Yes. I was Honorary Secretary for about ten years. I was manager from the beginning and left in 1921.

40,963. Did you suffer from too much official interference?—Not at all. As a matter of fact, most of our success was due to the official help we received, because in the beginning when the bank was first started there was opposition all round, from the moneylenders, the lawyers and almost everyone. We had to get the money from Lyallpur, Jullundur, Rawalpindi, &c. As our credit became established, however, the very people who used to oppose us took their money away from the Imperial and other banks and brought it to us. There was a time when we had more money than we could spend, and we had to lower the rate of interest. The very people

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who had at first opposed it used to come to me asking for preference in making deposits. Our credit was thus very well established and we advanced several lakhs to Lyallpur, Jullundur and Delhi.

49,964 You are in favour of the recruitment of the agricultural classes into the various departments of Government?—Yes.

40,965. To what extent would you carry that?—I would not sacrifice efficiency. A minimum qualification should be fixed for every service and a certain percentage of posts reserved for zamindars; but if men of the required standard are not available from zamindars I do not think efficiency should be sacrificed.

40,966. Would you give duly qualified agriculturists preference over others equally qualified?—Yes.

40,967. In the Education Department how far would you carry that?—Roughly speaking, 75 per cent. of the vacancies in such services should go to agriculturists and zamindars.

40,968. Why do you advocate that?—Because I have known cases where the zamindars have suffered, against the intentions of Government, because the officer in charge was not sympathetic.

40,969. In the case of ordinary village primary education, what would be the difference between the agriculturist and the non-agriculturist teacher?—So far as those posts are concerned, I would say, "Rural people for rural areas."

40,970. You think they are more in sympathy with the people?—Yes.

40,971. What about the Agricultural Department?—A man whose family has been carrying on agriculture for generations must be best fitted for such work. In Departments like Agriculture and Veterinary the giving of even more than 75 per cent. of the vacancies to zamindars would be justified.

40,972. *Professor Gangulee*: What are the difficulties in the way of popularising adult education in rural areas?—It is difficult to secure regular attendance. In the slack seasons they will all come, but when there is work to be done the attendance falls off: they do not care about it sufficiently.

40,973. Has any systematic effort been made to popularise adult education?—Yes; we opened a large number of night schools, and we find night schools have succeeded better than others.

40,974. Who are the teachers?—The ordinary school teachers. We give them a bonus.

40,975. The ordinary village primary school teachers?—Yes. Those night schools succeeded best which had the backing of the Co-operative Department.

40,976. Did you follow a definite curriculum?—No; the aim and object was to teach them reading and writing.

40,977. Is there any organised non-official agency in your district to assist such Government Departments as Agriculture and Veterinary, Co-operative, Education and so on?—No, simply private individuals.

40,978. *Sir James MacKenna*: In your first paragraph you express the opinion that since agriculture has become a provincial subject (by which I presume you mean a Transferred subject) the Government of India has not been giving that direction in matters of research that they formerly did?—Yes.

40,979. Have you any idea how that position could be improved and how the Government of India could help?—There should be some central organisation with the Government of India to help the Provincial Governments.

40,980. How would you do that? Would you have a central committee with the Government of India consisting of a few central officers and provincial representatives?—Yes, on the lines of the Indian Central Cotton Committee, which is an All-India body and which has helped the Provinces. There should be an All-India agricultural body on the same lines.

40,981. A research committee?—Yes, which should help the Provincial Governments and keep them awake.

40,982. Do you think they would like that? You have been a Minister yourself. Would you not have resented the interference of a central body? —It would not be an administrative body. They would give their advice, and I think the Minister and Heads of Departments would welcome it.

40,983. *Professor Ganguler*: It would be purely advisory? —Yes; it cannot be anything else.

40,984. *Sir James MacKenna*: Would it be a good thing if that central body had some funds?—That would help a good deal.

40,985. Have you any idea how those funds should be raised? —By contributions from the Provinces and the Government of India. People would not welcome a cess for a body like that.

40,986. An export duty or cess on the lines of that for the Cotton Committee would not be popular?—No; that would be misunderstood.

40,987. You do not like the idea?—No.

40,988. Nor the idea of an export duty?—No.

40,989. You think it should be contributions from the Central Government supplemented by contributions from the Provinces?—Yes.

40,990. *Sir Thomas Middleton*: When you say that research work done by Provinces should be codified, do you feel you do not hear enough of what is being done in other Provinces at the present time?—We do not. I feel that not only with regard to other Provinces but with regard to one's own. Take, for instance, the case of the Punjab. Several new varieties of wheat and cotton have come into existence, and if the results of research in that direction are codified people will get to know about them and research officers will be led to put more vigour into their work.

40,991. Would you entrust the work of codification to the central advisory committee to which you have referred?—I think that would be a good thing.

40,992. You say that agricultural education does not attract the best brains even from among agriculturists at the present time. Where do the best brains among agriculturists go at the present time?—Instead of choosing an agricultural career they go to an arts college, since posts in the I.C.S. or in the Provincial Civil Service and elsewhere are more attractive than agricultural positions.

40,993. Your experience is that that has happened in the Punjab?—Yes.

40,994. You draw an interesting parallel between the Veterinary and Public Health Departments and the number of officers of different grades possessed by each. Is it that for veterinary work a lower type of man is required, and thus there must be more supervision?—No, it is simply the way in which the system has evolved. I made inquiries into it and found out how the various posts were created. For instance, there was a Superintendent, and another Imperial Service officer was wanted, so they recruited one as Deputy Superintendent and put him under the Superintendent. The matter is one which requires early attention. On one occasion I visited a veterinary hospital and asked the Veterinary Assistant

to send a report to me. It took that report four months to reach me because, I found out it had to pass through so many channels. In some places there are a Superintendent, a Deputy Superintendent and an Inspector. Even some of the Imperial Service officers sit in different rooms of the same building and have to send their reports through each other; they cannot correspond direct with the Chief Superintendent. The whole system requires overhauling.

40,995. You refer to the fact that agricultural indebtedness has increased in the Punjab by the heavy burden of land revenue on owners of small holdings?—My point is this. The peasant proprietors feel keenly that they are not being treated on the same footing as, say, shopkeepers. A shopkeeper whose income is below Rs. 2,000 has nothing to pay. Government says this is a margin for bread and butter. The peasant proprietor thereupon asks, "Is there no margin for my bread and butter? Why should you tax my bread and butter?" I was aiming at having a land revenue assessment system whereby the economic holding may be free of taxation and a graded system of taxation applied to larger holdings. There is no reason why I, who possess only five acres of land, should pay at the same rate per acre as my brother, who possesses five lakhs of acres. The burden should be distributed in the same way as in the case of income tax.

40,996. Have you considered how that proposal, if given effect to, would affect the revenues of other Provinces, not so rich as the Punjab?—The revenue would not suffer at all; the bigger landlords would pay a higher rate. Just as the wealthy among the non-agriculturists pay more in proportion than the shopkeeper, so the big landlords must bear more of the burden than the smaller ones. I feel that this will be the next agitation in this country; people feel strongly about it. As a matter of fact, the Minister who has just retired has put down a notice of motion about this in the Punjab Council.

40,997. *Professor Ganguler*: What is the general opinion of the Members of the Council on this point?—Those who are big landlords will certainly resent it, but all the people from the South-East of the Province and the Jullundur Division will welcome it. The other districts have sent big landowners as their representatives, and they will certainly oppose it.

40,998. *Sir Thomas Middleton*: On the subject of animal husbandry, you refer to the Dhani breed. Has that breed qualities which could not be supplied by the Hariani or Thar-Parkar breeds? Is it necessary to maintain it?—I have no personal knowledge of that breed, but when I went to Rawalpindi people there told me they liked it very much. Each breed should be tried in its own area.

40,999. Is this breed quite similar to the Hariani?—Not altogether.

41,000. *Mr. Calvert*: What is your opinion of compulsory education for villages?—It has not succeeded so far, but efforts should be made to compel people to send their boys, and if possible their girls also, to school.

41,001. Do you think the time has arrived when we should be bolder in introducing compulsory education?—Once their holdings are consolidated less pressure will be needed. I think the time for it will come after that.

41,002. *Sir Henry Lawrence*: You heard the last witness tell us it was a cruel libel on the cultivator to say he spent his money in litigation, but I see you put litigation down as one of the causes of indebtedness?—I do.

41,003. Do you think the cultivator is prone to unnecessary litigation? —There are two sets of cases. Part of the litigation is not his own choice; he is compelled by others to go to court. There is, on the other hand, certain litigation which can be avoided if Government will help. For

instance, one-third of the cases I have seen in the South-East of the Punjab relate to *abadi* land or something connected with it. A man who wants to build a house may encroach on *shamilat* land, and then he is sued for an injunction or a criminal case is brought. Once a ball of that kind starts rolling it is difficult to stop it; other cases follow. Government ought to come to his help.

41,004. How can Government do that?—If Government can acquire land in Bombay for building sites, surely Government can come to the help of the villages also. For instance, I know one village in the Rohtak district where one party has been ruined on account of *abadi* litigation. A certain line was drawn at the time of the last settlement (about 40 years ago) and the land on one side of it reserved for *abadi;* on the other side it is *shamilat*. Whenever anyone want to go out, whatever his share may be, someone is found to come to the court and ask for an injunction and an injunction is granted. The village is not allowed to develop. There are a number of cases like that.

41,005. What is your proposal? That there should be some acquisition of land by Government for village sites?—Yes, District Boards should have some power to improve village sites.

41,006. Have they not that power now?—No.

41,007. You wish that power to be given by legislation?—Yes.

41,008. Is there any such proposal now before Government?—No.

41,009. Could other causes of litigation be avoided if arbitration became the rule?—Yes. If arbitration societies were established in villages half the litigation would cease.

41,010. That also requires legislation?—Yes.

41,011. You advocate these two forms of legislation?—Yes.

41,012. Which, so far as you know, are not being considered by Government?—That is so.

(The witness withdrew.)

The Commission, after examining Rao Sahib Rao Abdul Hamed Khan, whose evidence will be found in volume VII (United Provinces), proceeded to the Punjab and commenced taking evidence at Hissar.

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Saturday, February 26th, 1927.

HISSAR.

PRESENT:

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S. (*Chairman*).

Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E. I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. W. ROBERTS, B.Sc. (*Co-opted Member*).

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries*).

Mr. R. BRANFORD, Livestock Expert to the Government of the Punjab and Superintendent, Government Cattle Farm, Hissar.

Replies to the Questionnaire.

QUESTION 15.—VETERINARY.—(a) Under existing conditions in the Punjab I think the Civil Veterinary Department should not be under the Director of Agriculture. The Director of Agriculture was already overworked a year or two ago, and his duties recently have enormously increased, he has no time to pay adequate attention to the Civil Veterinary Department.

(*d*) The chief obstacles in dealing with contagious disease, so far as my short experience of district work has allowed me to form any opinion at all, are:—

(i) Delays in reporting outbreaks of disease.
(ii) Inadequate veterinary staff.
(iii) Absence of legislation.
(iv) Ignorance and apathy of the stock owner.

I do advocate legislation, chiefly in connection with rinderpest. Rinderpest is probably the cause of greater loss than any other disease with which we have to deal; it could, I am sure, be effectively controlled had we power to prevent movements of animals from infected areas, and power to segregate in contact and infected animals.

Had we such powers, our consumption of anti-rinderpest serum, could be enormously decreased, and we should probably be able to confine ourselves to the serum—simultaneous method of preventive inoculation.

I do not think that the Police, in the present condition of that Force and the country, could effectually enforce such laws, but I do not think that legislation should be for ever delayed on that account. If we are ever to really control disease we must have legislation of some sort. The rules might be made applicable by notification to districts or even smaller areas only, and we could start on a small scale.

Failing legislation, I have nothing to suggest except that we should continue our present campaign of education and propaganda in favour of rational methods of disease control. Nothing but legislation will ever be really effective, and if the country is not ripe for it, we must go on with the rather dreary work of trying to educate up to it.

(*g*) I do consider further facilities for research desirable. I think it is a matter for reproach that the Government of India spend such a very small sum on this subject. The expenditure on the Muktesar Institute for example is mainly borne by the Provinces, in the shape of fees paid for sera and vaccines supplied:—

(i) and (ii) I advocate extension of both.

(*h*) (i) and (ii) By either, or both, or in collaboration as officers with suitable experience and training may be available.

(1) I do recommend the appointment of a Veterinary Adviser to the Government of India.

I think it another matter for reproach that a great Empire like India, the main industry of which is agriculture, should be without a Veterinary Adviser.

The advantages that would accrue from such an appointment would be:—

(1) The officer should also be in administrative charge of the Muktesar Institute. That would relieve the Director of that Institute—(*a*) of his administrative duties which at present occupy too much of his time, and (*b*) of the duty of advising the Government of India on veterinary matters and would set him free to do the work he was trained to do and I imagine recruited to do, viz., research work and the manufacture of sera and vaccine.

(2) The Government of India would have access to reliable advice on veterinary matters, from an officer with the necessary experience.

(3) Research work throughout the country could be effectively co-ordinated.

QUESTION 16.—ANIMAL INDUSTRY.—(*a*) The difficulties in the way of effecting any general improvement in the cattle of the Province, or even of a particular district are colossal.

I do not think that as practical measures much improvement on the Civil Veterinary Department schemes in the Province are possible. These have been fully described by the Chief Superintendent, Civil Veterinary Department.

All schemes depend for success on co-operation between all departments and officers concerned. In my opinion, measures should be taken to insure adequate co-operation in the future. For example, issuing stud bulls capable of getting improved stock is not much use in the long run, if the stock produced are not adequately fed. The work of stud bulls is handicapped by the presence of numerous immature, often deformed, and almost always undersized and ill-formed male stock running in the same herd. Issuing bulls without an attendant scheme for castration of unfit male stock is not much use.

I think in the Province we are already working on the right lines, our schemes permit of expansion if the necessary staff and money can be provided. Given adequate co-operation in the future, progress will be made.

(*b*) My replies to questions under this head apply to the Hariana tract. They indicate some of the difficulties under which any scheme for the improvement of cattle stock have to contend.

(i) No sort of effort is ever made to limit the stock on any common pasture, to the number that pasture is capable of carrying.

As a rule such so-called pastures are so heavily overstocked that they produce nothing.

In ordinary years, for the greater part of the year, they are nothing more than exercising grounds without a blade of grass on them.

(ii) I do not think any enclosed pastures exist in the Hariana tract, except on Government farms, unless some have been recently started in Gurgaon.

Grass borders to tilled fields do exist, it is on such borders that cattle when they are allowed on to stubbles after harvests get the best grazing they ever do get; such periods of good grazing are usually very short.

(iii) Speaking generally this area is always on the edge of a fodder famine. No one when stall feeding, can ever really afford to feed a full ration, as he must always be thinking of saving up against the next famine. Cattle other than working bullocks, good milch cows in milk, young bullocks being prepared for sale, are generally underfed when stall fed.

(iv) For all practical purposes, cattle in the *barani* tracts, and about 90 per cent. of the area is *barani*, get no green fodder at all, excepting for a month or two in the rains.

It is somewhat extraordinary that good cattle can be and are reared under such conditions, but such is the fact.

Cows on the Hissar Farm, for example, will suckle a calf for nine months, and wean him in fat condition, without ever receiving a pound of either green fodder or concentrated ration. These cows usually subsist on grazing alone, and for ten months in the year the grazing is on dry grass.

No doubt the absence of green fodder is a serious handicap, a handicap especially felt by the dairy industry but the absence of green fodder does not make the breeding and rearing of good cattle impossible.

(v) I know of no evidence of absence or deficiency of mineral constituents in feeding stuffs in this tract. The natural inference is all the other way. There must be some reason for the higher quality of Hariana cattle as compared with those of neighbouring districts.

The superiority of Hariana cattle is certainly not due to better feeding in point of quantity, the inference is that the little they do get is usually of better quality.

Working to the eastwards especially from Hariana the cattle while remaining markedly of the Hariana type, deteriorate in quality, although both rainfall and quantity of grazing rapidly improve.

(*c*) Fodder shortage is usually most marked from February to July. Sometimes stock get a short interval of decent grazing on stubbles after the harvest of the cold weather crop, if there has been any crop, and that as a rule is about one year in three.

The natural grasses in the tract are all hot weather grasses, none of them grow to be much use for grazing in the cold weather, even in the event of rain. Where cattle depend mainly on grazing, they have to exist on what growth occurs in the monsoon period. This growth usually attains its maximum, some time early in September. The grasses are usually dead and withered early in October. As a rule in the district nothing is left by the middle of the cold weather.

Growth of grass is very rapid if enough rain falls at sufficiently frequent intervals in the monsoon. Grazing will be available as a rule ten days after a good fall.

We do not as a rule get useful rain in this tract before some date in the first half of July.

(*d*) A system of enclosed areas for pastures would be useful. I believe experiments in this connection have been or are being begun in the Gurgaon district. While cattle remain at the present very unremunerative prices, I do not see much hope of land being enclosed for pasture on a large scale. Areas suitable for enclosure for pasture will yield a crop in good years. It is a doubtful economy at present prices for cattle stock to substitute pasture for crops.

A great deal more fodder could be grown on the irrigated areas in the tract than is the case at present. No doubt the cultivator would grow less cotton and sugarcane if millets paid him as well. The tract is so subject to fodder famines, and fodders sell at such high rates in famine time, that fodders might really pay better than cotton if the grower could afford to wait for his money.

I think more fodder would be grown if Government could come forward with a scheme to buy and store fodder with a view to selling it again in famine times.

To make the scheme a success Government would have to purchase at a rate high enough to make the cultivation of the fodder at least as profitable as is cotton.

Arrangements for early harvesting would have to be made, so that the fodder retained a high feeding value. Arrangements for efficient stacking would have to be made, and the stackyards should be as near a railway as possible.

Now that the price of cotton has gone down so much, I do not think that such a scheme under efficient management would involve Government in much loss.

In the last bad famine in the Hissar district very inferior fodders were sold in large quantities at rates varying from 30 lbs. to 40 lbs. per rupee. I think if as an experiment Government would guarantee to buy good quality *juar* hay immediately after harvesting at say 80 lbs. per rupee, that more fodder would be grown, and the chances of Government being put to any great loss would be small. There might even be a profit if a large amount could be stored, and a fodder famine followed quickly after storage.

Oral Evidence.

41,013. *Sir Henry Lawrence*: Mr. Branford, could you tell us what your position is?—I am both the Superintendent and Assistant-Superintendent of the Government Cattle Farm, Hissar, and also Livestock Expert to the Government of the Punjab.

41,014. Are the posts to be always combined?—No; the idea is to separate them.

41,015. You are temporarily holding them?—Yes, owing to the shortage of staff.

41,016. Are there any cattle breeding farms at the time in this Province?—Several.

41,017. Run by the department?—Under the general supervision of the department; we have several grantee farms.

41,018. How are they administered?—They have been administered by the Civil Veterinary Department (now by me). The land was given by the Punjab Government to various gentlemen for cattle breeding on condition that they maintained so many cows per square.

41,019. These are all zamindars to whom the land has been given?—Yes; they have been under my charge. Raja Fazal Dad Khan is one of them; I think he has got about 3,000 acres.

41,020. How many such farms are there?—About eight.

41,021. On page 259 of the memorandum, three such farms are mentioned?—Yes, three for the Hissar breed and three for the Montgomery breed, and there are two other dairy farms as well.

41,022. That makes the number eight; have you any for Dhanni?—No; Government now propose one, but it has not yet come into being. The department proposed a farm for Dhannis in 1910.

41,023. The breeds that you propose to take up are Hissar, Montgomery and Dhanni?—Yes, and possibly also the Bhagnari. I know very little about this breed. Mr. Quirke will be able to tell you more about the Bhagnari breed than I can; I have no personal knowledge of it either.

41,024. Are there any breeds required in the north, for the hill tracts?—I think a certain number is required.

41,025. But there is no definite proposal yet?—I know of no concrete proposal for the hill tracts. I think that the Civil Veterinary Department has done something to try and improve the hill tracts breeds, but what exactly it is I do not know.

41,026. How do you divide the Province? What area in the Province is suitable for the Hissar breed and what area is suitable for the other breeds?—Roughly I should say that the south-east of the Province is suitable for the Hariana. Again, on this matter Mr. Quirke will be able to give better information. I have been breeding cattle and doing nothing else. He can give you the exact information.

41,027. In this memorandum, it is pointed out that the chief obstacle to the improvement of cattle in this area is the danger of famine: do you accept that?—Yes, undoubtedly; that is the chief obstacle.

41,028. The zamindars are afraid to take up good stuff for fear of losing them in the famine?—Yes. Cattle breeding is the main industry in this district, and we have suffered a great deal on account of famine.

41,029. Are you acquainted with any scheme for providing fodder in time of famine?—Yes, the ordinary fodder concession rate scheme.

41,030. Could you tell us what that scheme is?—That is a scheme under which you can import fodder at a concession rate, the concession to be given by the Government of India.

41,031. Import from where?—From wherever you can get it. As the famine gets more and more severe, they get from long distances without any limit. They get also from the Central India and the Jhansi district.

41,032. In times of famine you get your grass from as far away as Central India?—Yes; a great deal of it came from the high land round the Jhansi district.

41,033. The alternative is to have fodder farms somewhere in the neighbourhood. Where is the Nilibar?—In the South-West of the Punjab.

41,034. Have you seen the scheme for that farm?—I have discussed the scheme very broadly with Mr. Emerson when it was being proposed.

41,035. Have you any idea of the total cost of that scheme?—I could not give you any accurate figures, not any more accurate than are in the programme.

41,036. They are not in the programme; that is my difficulty. Is that scheme likely to be taken up? Has it received sanction?—I do not think so; I have no knowledge that it has received sanction.

41,037. Do you advocate that that should be carried through?—I think any method of getting fodder is worth taking up. I do not hold that the absence of fodder is the main enemy of cattle breeding, but it is a very important difficulty in cattle breeding.

41,038. This is not the main enemy?—No.

41,039. Do you regard disease as the more important?—I regard Hinduism as the main difficulty.

41,040. In what aspect?—Owing to the fact that cattle have a religious aspect; you cannot destroy or get rid of the rubbish. About 50 per cent. of the cattle in this area are rubbish; they are worth nothing. In this district enormous sums are spent on buying up old cattle.

41,041. *Sir Thomas Middleton*: What percentage do you class as being rubbish?—About half; I cannot give you any accurate figures, but huge sums are spent in buying absolutely worthless cattle and keeping them alive.

41,042. *Sir Henry Lawrence*: How long have you been in charge of this farm?—Since 1911.

41,043. When was this farm first taken over from the Military?—1898.

41,044. Since 1898, what has been the main aim and object of this farm, the improvement of the Hissar breed?—To breed up a stud bull which is both liked by our clients, the District Boards, and which will improve the country stock mainly from the working point of view.

41,045. Is it your experience that in these thirty years the cattle have been improved and the stud bulls now sent out are of a satisfactory type?—I think they are far more satisfactory than they were; certainly they are far more liked than they were; the percentage of complaint is much less.

41,046. But at the moment this farm can only serve about one-fourth of the Punjab; is that the right figure?—From the point of view of suitable cattle or from the point of view of the number?

41,047. From the point of view of suitable cattle?—I could not say how much it can serve; I should think about one-third.

41,048. Considering the demand that the District Local Boards and zamindars are making on you, what portion of that demand can you supply?—Nearly all of it; we have, generally, nearly complied with the demand.

41,049. We have been told a few days ago that in in the Gurgaon district the indent has been cut down to one-third?—I have not yet got that indent; I do not know if Mr. Quirke has got it. If I had it that would increase our percentage of failure to comply this year. We shall not be able to comply this year.

41,050. Now in regard to the ideal which some people advocate, that Government farms should produce a dual purpose animal both for plough and for milk, you have not aimed to produce an animal with that object?—It has not been one of the main planks in our programme.

41,051. You think it is an impossible object to attain?—I think it is an ideal that might be attained.

41,052. But at a heavy cost?—It will be very expensive.

41,053. What would be the principal item in the extra expense as far as this particular farm is concerned?—The extra expense is due to extra feeding and also to attendance, and we work on the basis that the returns obtained from the milk at the end should pay for the attendance and extra feeding. At present our cows get no feeding in normal years, they are allowed to feed themselves entirely by grazing. Milk selling at present prices does not pay.

41,054. And in addition to those items is there much extra expense in recording the yield?—Yes, we should have to increase our supervising staff a great deal; and this would of course be included under attendance.

41,055. Could you mention any figure as to the average cost of turning out a two-year or two-and-a-half-year-old heifer under the circumstances necessary?—I could not give you the figure off hand with any degree of accuracy, but I could work it out and let you have it.

41,056. Would you work it out and let us have the figure?—Yes, I will.*

41,057. *Sir James MacKenna*: What are your views on the sheep breeding problem as a possible development of agricultural husbandry in India?—I am very keen on sheep-breeding. I myself think that the average big zamindar would increase his profits.

* Information subsequently supplied by Mr. Branford: "(i) The cost of rearing a stall-fed animal would vary from Rs.200 to Rs. 300. (ii) The cost if reared on grazing (no charge being made for grazing), i.e., ranch-reared, including the usual amount of additional fodder necessary on this farm, would vary from Rs. 40 to Rs. 60. The above figures include estimated cost of attendance."

41,058. On what lines would you go?—I would go in for wool and mutton. All the time I have been here it has been my experience that the sheep have always paid, whether during famine or otherwise.

41,059. There are considerable climatic limitations, are there not?—Yes, sheep will not thrive in low-lying, swampy areas. A large part of the Punjab is undoubtedly suitable.

41,060. And the Central Provinces as well?—I do not know the conditions in the Central Provinces, but I should think the same is the case there.

41,061. Burma, about which you have some knowledge, would be geographically suitable, I take it?—Yes; parts of the dry belt.

41,062. What line have you been following in sheep breeding?—We have tried to grade up the wool with the merino cross.

41,063. What success have you had in that?—We have succeeded in grading up the wool; I have come to the conclusion that you cannot carry the merino cross too far. You have to go back to the country ram after the second or third generation.

41,064. What about the question of sheep dips?—Scab is always present in this district. I have had several outbreaks of scab which I have always been able to cure by dipping.

41,065. I suppose the question of regular dipping is an important factor in the development of sheep breeding on a large scale?—I do not know. It is not an important disease in the Punjab so far as I know, as the losses from scab are very slight in the Punjab. I have heard that scab is a very important disease in Baluchistan.

41,066. Have you visited other cattle breeding farms either in this Province or in other Provinces?—I have visited the Karnal farm and the Pusa farm.

41,067. What do you think of the work that is being done at Karnal?—I think that the work being done there is valuable.

41,068. Is it being done on the right lines?—Yes.

41,069. *Sir Henry Lawrence*: And expensive, is it not?—Very expensive I should say; I have not got the figures with me.

41,070. *Sir James MacKenna*: Were you present at the last meeting of the Board of Agriculture?—Yes.

41,071. What do you think of the idea mooted there of having a Central Cattle Committee or a Central Bureau?—I seconded the proposal myself; I am in favour of it.

41,072. You think the problem is attaining an importance which warrants a sort of an All-India organization of that kind?—Undoubtedly.

41,073. Are the problems common to all people engaged in the question of cattle improvement and dairying?—Undoubtedly.

41,074. Do you think there would be any advantage in co-ordination?—Yes, I think so.

41,075. On page 118, with reference to the question of a Veterinary Adviser with the Government of India, you say: "The advantages that would accrue from such an appointment would be:—(i) The officer should also be in administrative charge of the Muktesar Institute. That would relieve the Director of that Institute of his administrative duties and also of the duty of advising the Government of India on veterinary matters." What is your idea of the division of responsibilities between these two officers? Do you think it would be possible for the Veterinary Adviser to be in administrative control at Muktesar?—Yes, he might be; and this would set the Director free to do research work and the manufacture of sera and vaccines.

41,076. I take it that the Director's responsibility, according to you, would be limited to the regulation of the scientific programme inside the Institute, and the Veterinary Adviser would be responsible for the administration of the Institute, i.e., administration of the farm, which is a very big matter, *plus* advising the Government of India in veterinary matters?—Yes.

41,077. *Professor Gangulee*: You have already answered the question put to you with reference to the Central Cattle Bureau, but I would like you to develop your idea with regard to that a little more. What are your reasons for making this suggestion?—I think it will assist the officers concerned; they could appeal to it for advice and it could draw up a herd book; it would help the formation of a pedigree herd.

41,078. It would perhaps also help to control all the pedigree records?—It would.

41,079. And would this Central Cattle Bureau be under the Veterinary Adviser to the Government of India?—I have not considered the question at all, but I should think that in the present conditions it would be under the Agricultural Adviser to the Government of India. The majority of the cattle-breeding officers are agricultural officers, not veterinary officers, and it depends whether cattle breeding will come under the Veterinary Department or under the Agricultural Department.

41,080. Would you have the Cattle Bureau situated at Pusa or somewhere else?—It does not matter much where it is situated so long as the officers can meet together somewhere.

41,081. You say that one of the advantages that would accrue from the appointment of a Veterinary Adviser would be that research work throughout the country could be effectively co-ordinated. How would that be done?—He would be able to suggest that research work was advisable in a particular Province, and he would also know what research work was being done or had already been done in other Provinces, whether any such work was necessary here or not and so on.

41,082. Do you think the provincial Livestock Experts would welcome such an organisation for research work?—Yes, they undoubtedly would welcome it because in the case of a disease the Veterinary Adviser might be asked to investigate it.

41,083. Turning now to your note, do you think that the separation of cattle-breeding work from the Civil Veterinary Department would accelerate the rate of progress in cattle improvement in the Province?—No, I think it would retard it.

41,084. The Veterinary Department would of course be chiefly concerned with the diseases of cattle?—We are chiefly concerned with the diseases of cattle, but a very large amount of our activities have been directed towards cattle breeding in the Punjab.

41,085. You would not like to see the work of cattle breeding separated from the Civil Veterinary Department?—I should like to see the work of cattle breeding in this Province better co-ordinated and better organised. At present the Director of Agriculture has a great deal too much to do and cannot therefore be expected to concentrate much attention on cattle-breeding operations.

41,086. You think that cattle-breeding work can best be co-ordinated through the Civil Veterinary Department?—I think there should be a Department of Animal Industry which should include Veterinary with a separate Director.

41,087. And would that Director be under the Veterinary Department?—He would be under the Financial Commissioner, Development.

41,088. To turn to your farm here, I should like to know what you consider to be the requisite qualifications of men engaged in a cattle-breeding farm like the one here at Hissar?—Experience in stock farming and a veterinary diploma.

41,089. Is any technical training necessary?—If he was a Member of the Royal College of Veterinary Surgeons that would be an advantage, and also knowledge or experience of crop growing would be an additional advantage.

41,090. He ought to have some agricultural education in addition to merely veterinary education?—Yes.

41,091. Are you satisfied with the qualifications of your assistants employed on this farm?—I have not got any assistants; I did have one. I have got a man on training; he is quite promising, but I have not had him long enough to know whether he has got the necessary aptitude for stock farming at present; I had an efficient assistant, but he is not at present with me.

41,092. As you are discussing this question of training, is there any place in the Punjab where suitable training can be given in the science and practice of cattle breeding?—None that I know of except here.

41,093. Is there any accommodation here for training?—No, there is no accommodation for students to live.

41,094. At the Lyallpur Agricultural College have they any arrangements for teaching the science and practice of cattle breeding?—I have no doubt they have the ordinary college curriculum.

41,095. Have you arrangements in any of the farms here for teaching the practice and science of cattle breeding?—No, I have no regular course in cattle breeding; a number of people have been here for training.

41,096. In other Provinces we have been told that cattle breeding does not pay; *what is your experience in this Province?*—The same.

41,097. It does not pay? It does not pay.

41,098. Could you tell us why it does not pay? Because the price they have to sell at is not sufficient; if the average man who rears a bullock or cow here for sale kept accounts and put down the cost of all the food that he has given the animal, it would be found to come to more than the price he gets for it when he sells it.

41,099. Is there any export demand for good bulls from the Province?—None or very little, except Government bulls; there is very little demand for the bull of the ordinary villager.

41,100. Have you exported any bulls from your farm?—Many hundreds.

41,101. You mean exported to other countries?—Yes.

41,102. At a reasonable price?—Yes.

41,103. If the ordinary zamindar goes in for breeding, can he not sell to the exporters?—He never does go in for breeding bulls in this district.

41,104. Because it does not pay him?—He has never tried as far as I know; the usual thing in this district is for the zamindar to castrate his young stock and sell as bullocks.

41,105. *Sir Henry Lawrence*: What price does he get?—It depends whether he sells his stock as yearlings; the usual thing is to sell as yearlings; a yearling usually fetches about Rs.50; if it is sold as a bullock the usual price is Rs.160 or Rs.170; but I am only guessing. Rs.200 is a good price.

41,106. That is at three years?—Three or four years. I could buy quite a number of good bullocks to-morrow at about Rs.180.

41,107. *Professor Gangulee*: Do you find the ordinary zamindars of the Province keen on cattle breeding?—I really do not know this Province; I

only know this particular district; I have been on this farm nearly all my life.

41,108. Are the zamindars in this district keen?—The main industry in this district is cattle breeding; it is the only thing they can do.

41,109. And is it paying?—It may pay them as an adjunct to their general farming because they have a certain amount of free grazing in this district.

41,110. This morning when we went over your farm we were told that you supply a number of bulls to the District Boards?—We do.

41,111. What is your agency for the distribution of these stud bulls?—The Civil Veterinary Department.

41,112. The District Boards send in their applications for bulls?—Yes, through the Civil Veterinary Department; Mr. Quirke will tell you about that; I breed the bulls and he arranges for the distribution.

41,113. Are there any co-operative cattle breeding societies here?—There are.

41,114. Do you know what assistance they get from your farm?—We do not give them any assistance; we have sold them a few heifers. Mr. Quirke, through the Civil Veterinary Department, gives them every assistance he can.

41,115. You are chiefly concerned at this farm with the question of fodder?—We are concerned with the question of cattle breeding; the fodder is a very important item and often a matter of great difficulty.

41,116. Is there any feeding experiment going on?—When we have had sufficient staff we have done and do do feeding experiments.

41,117. Are you in touch with the Bangalore work?—I have read Mr. Warth's work, &c.; I have done similar work here and published it.

41,118. Do you have in this Province any survey of the various kinds of grasses that could be utilised for fodder purposes?—I know the grasses.

41,119. You have the data indicating their feeding values?—I know the feeding value; I know the work that has been done on grasses in this Province in the last fifty or sixty years, or whatever the period is. Work has been done.

41,120. I see from your note that you are greatly interested in silage work. Do you use tower silos or pit silos?—Mine are all pit silos.

41,121. Do you find the pit silos successful?—Very.

41,122. Are the zamindars in the neighbourhood interested in your experiments?—They are not interested in silage at all; I never met one that was. Silage making is not very suitable for *barani* country, you know.

41,123. I suppose the castration of inferior bulls is not in your department?—It has never been my work.

41,124. Perhaps Mr. Quirke will be able to tell us about that?—Yes.

41,125. Is there any cattle insurance society here?—There are some in the Province.

41,126. *Mr. Calvert*: In answer to the Chairman with regard to concession rates for fodder, I think you stated that the difference between the full rate and the concession rate was met by the Government of India?—Yes.

41,127. Did you not mean the Punjab Government?—I thought it was the famine fund of the Government of India, but I may have been incorrect; I do not know the famine code very well.

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41,128. You are putting *juar* into silos, are you not?—Most of my silage is made from *juar*; we have also used grass; where hay can be made it is much more economical to make hay, but where you have rough grasses which do not make good hay, it is better to make them into silage.

41,129. Is there much loss in your *juar* silage?—I have not got an accurate figure; it is rather difficult to work out the figures from pit silos; I should say the loss is about 5 per cent.

41,129. Do you think that loss is sufficient to deter an ordinary cultivator from taking to the use of silos?—No, I do not think it would; I think the paucity of canal area in this district is the reason why they do not go in for it in this area; the land is nearly all *barani*. It is only when you can get a second cutting that the ensilage of *juar* pays.

41,131. Am I correct in deducing from your answer that the prospect of making cattle breeding pay depends on the price of the animals rising to a reasonable amount?—I think so.

41,132. It is stated in this Government memorandum supplied to us that the Province requires 50,000 approved bulls; what is the normal mortality among 50,000 approved bulls?—I should think the wastage would be about 20 per cent.

41,133. How many would you require to replace wastage?—You would require 10,000 bulls; that is an estimate.

41,134. That is a rough figure?—Yes.

41,135. I think you have seen these farms in the Canal Colonies?—Yes.

41,136. Would you say they are pretty successful?—No, I should not; one has gone on very well indeed; you might say one has been completely successful but the others I should say have not.

41,137. *Sir Ganga Ram*: Successful in what respect; in paying or producing quality?—Producing quality and in general efficient management.

41,138. *Mr. Calvert*: If those farms were sold and the money placed at your disposal, do you think you could give better results for the money?—Yes, I think so certainly, given staff.

41,139. In order to encourage the growing of fodder crops, the water rate was reduced from Rs.3 to Rs.2, at a loss estimated at 16 lakhs?—Yes.

41,140. Do you think that 16 lakhs could have been spent to better advantage on some Government scheme of growing fodder and stocking it against famines?—It depends to what extent that concession rate encouraged the growing of fodder; how much extra fodder was produced; I have not got figures; if it did not produce a large additional area of fodder it was money wasted.

41,141. Speaking of the area in this Province which is known to you as the Hariana tract, would you say there has been a deterioration of the bullock power in that area?—I have not seen much evidence of deterioration in bullocks in the fifteen years I have been here, but I should think deterioration is almost inevitable. I personally have not noticed very much.

41,142. *Sir Henry Lawrence*: Inevitable from what cause?—Because a large proportion of old and thoroughly bad cattle are kept which eat the fodder which should go to the good ones; every time a famine occurs, good cattle are being wasted to support cattle which are rubbish.

41,143. *Mr. Calvert*: At Sonepat we were told that the people thereabouts had some objection to the bulls of this farm; could you explain that?—I do not know; I have never toured the Rohtak district very much, but I know the people in the Rohtak district as a rule do not like the Hissar bulls.

41,144. What is the basis of that, do you know?—I have not the faintest idea; I think it is mostly prejudice. Of course, the villagers often do like our cattle; quite recently I have had villagers from Rohtak come to buy bulls at bigger prices than the Rohtak District Board would have to pay.

41,145. Have you ever attended the Jehazgarh or Hissar cattle fair?—I always attend the Hissar cattle fair; I have attended Jehazgarh fair more than once.

41,146. How do the cattle brought there for sale by the ordinary cultivator compare with cattle from your farm?—A fine lot of cattle come into both these markets; a large proportion of them are by bulls from our farm in this district.

41,147. I do not understand why people who breed such fine animals should object to your bulls?—There is a prejudice; I have had men from Rohtak here and they have said they simply loved the cows but they did not like the bulls because they had got thick tails. It is really due to the dislike for the Montgomery breed which is supposed to be, and is in fact, slow and inactive. The characteristics of the Montgomery breed are a long thick tail, a long dewlap and a generally loose skin; anything showing those characteristics is disliked not only by Rohtak but by the whole of the Hariana breeders.

41,148. *Sir Henry Lawrence*: How does that apply to your Hissar bulls?—It does not, but this farm is descended from the Military farm which went in for cross breeding, and therefore the cattle occasionally show a thick tail. People know that the Montgomery cross has been used here, although very little, and they say that the thick tail is derived from that breed, and they will not have them. Of course, the Gujarat cattle also have rather a loose skin; nearly all the milk breeds have loose skins. For that reason the people did not like them. Mr. Bruen in one of his notes says that the characteristics his people like and for which he has to breed are a long dewlap and a loose skin; our people want the exact opposite.

41,149. *Mr. Calvert*: Actually the local objection is not based on any of the points of the bulls?—They will buy nothing with a long sheath or a thick tail, however good the animal may be otherwise. But the Rohtak district does buy from us; they have taken eighty or ninety bulls from this farm in the last twelve months; they took twenty the other day.

41,150. Do you think this Hariana breed has possibilities for a good dual purpose animal?—Yes, undoubtedly.

41,151. That could be done by selecting from the Hariana breed without any introduction of a milk strain?—Undoubtedly; the Hariana already is very often a very good milk strain.

41,152. *Sir Henry Lawrence*: Do you distinguish between the Hariana and the Hissar?—Yes.

41,153. What is the distinction?—The fact that our cattle are admittedly not purely descended from Hariana.

41,154. *Mr. Calvert*: Do you mean that your Hissar cattle are not a pure breed now?—We are gradually building them up into a pure breed; they are breeding pure now, as I demonstrated this morning.

41,155. *Mr. Kamat*: We are told in this memorandum submitted to us by the Punjab Government that with regard to cattle breeding the definite policy of the department has been the preservation and improvement of the indigenous breed of the Province by a process of selection from amongst the best specimens procurable. I am sure you are carrying on that policy on this farm?—Yes.

41,156. I ask you as a cattle breeding officer of experience whether some other policy, such as that of cross breeding from Ayrshire bulls would or would not be successful?—I think it would mean the total ruin of the breed.

41,457. You mean total ruin so far as plough cattle are concerned?—Or milk.

41,158. So that you are entirely against it?—I am entirely against it for the villager.

41,159. You are against crossing Indian breeds with Ayrshire or any foreign bulls?—Yes, with any foreign bull.

41,160. How would this ideal of producing a dual purpose animal work, having regard to village life as it is in India? Am I right in thinking that, in the Indian village, plough cattle preponderate?—I should say so.

41,161. The villager requires more plough cattle, more bullocks than cows. Suppose a dual purpose animal is produced for the village, do you apprehend that the supply of milk from high yielding cows would be too much for the village and would not find an outlet?—Most of these villages have got buffaloes.

41,162. Yes, they depend on the buffalo. In addition, supposing as a result of this dual-purpose-animal policy you have also cows giving plenty of milk, as good as the she-buffalo, how could they utilise the whole of the milk in the village?—You would not want the she-buffalo.

41,163. Therefore if you pursue this dual-purpose-animal policy, you will have to eliminate the she-buffalo?—It might eventually be eliminated.

41,164. Here again I ask you as an expert cattle breeding officer, will that be possible in an Indian village, that a she-buffalo, whose milk is perhaps valued by the people for the fat it contains and its cheapness, would ever be eliminated in preference to the cow?—It is very doubtful.

41,165. Then what happens to this policy of producing a dual purpose animal?—I think it very often happens that in a village where there is a very great shortage of fodder that village is maintaining a large number of female buffaloes for milk. It will be very advantageous if that village could decrease enormously the number of the buffaloes.

41,166. In this competition between the buffalo and the milk producing cow, what would be the position of the buffalo?—It would eventually be eliminated.

41,167. Is that in the first place desirable and in the second place possible in this country?—I should think in many places it is very desirable, but it is doubtful whether it is possible.

41,168. In answer to one of my colleagues you said that cattle breeding does not pay. Do you mean that cattle breeding does not pay for the ordinary zamindar or it is not paying on this farm?—It generally pays on this farm. Cattle breeding pays if you can get sufficient cheap or free grazing by any means or other.

41,169. Supposing we advocate to the ordinary zamindar either in this Province or in the United Provinces that he should take up cattle breeding on a large scale, then you have to make suggestions as regards grazing; otherwise you say cattle breeding does not pay. The two questions are intimately connected?—Yes.

41,170. *Professor Gangulee*: What about the cattle breeding societies that you have formed here? Do you know whether they are paying?—They are not paying, but they are doing very good work.

41,171. *Mr. Kamat*: My question is, supposing we advise the zamindars either in this Province or in the neighbouring Province that they should take more and more to cattle breeding: you say cattle breeding without grazing facilities does not pay. Do you not think that advice regarding cattle breeding should be coupled with similar advice as regards grazing facilities? Have you any suggestions to make as to how to obtain facilities for grazing?—I do not know. Various proposals have been put forward.

41,172. You have no concrete proposals to make?—For a general cattle breeding policy including increase of grazing facilities?

41,173. Yes?—It seems to me that one most important thing is that you should get the land for grazing.

41,174. On page 118 of your memorandum, you refer to grass borders. Do you think that any policy of having larger grass borders would be feasible in this Province, or for the matter of that, in any Province? Have you any suggestions to make in that respect?—I do not think it is likely that anybody will give up land growing crops under the present conditions to grow grass. Crop growing is so much more profitable nowadays. I think it is an economic question.

41,175. And a difficult question?—Very difficult.

41,176. Speaking about stall-feeding, you say on page 119 of your memorandum: "No one when stall-feeding can ever really afford to feed a full ration, as he must always be thinking of saving up against the next famine. Cattle other than working bullocks, good milch cows in milk, young bullocks being prepared for sale, are generally underfed when stall-fed"?—Yes, it is always so.

41,177. So here again it is not a very feasible policy to advise stall-feeding for people who take up cattle breeding?—I think anybody who will take to cattle breeding at the present time on a system of stall-feeding will be ruined in no time.

41,178. With regard to your suggestion for an independent Veterinary Adviser to the Government of India, on whom do the Government of India at present depend for their veterinary advice?—I understand they are going to the Muktesar Institute; but really I do not know anything about the Government of India.

41,179. When you make a suggestion that there should be a separate man, that implies you are not satisfied with the present arrangements. What are the present arrangements?—There is no arrangement as far as I know. No such person exists now.

41,180. Does the Agricultural Adviser in consultation with the Director of the Muktesar Institute convey veterinary advice to the Government of India?—The Agricultural Adviser is here; you might ask him.

41,181. When you make a suggestion like this, naturally the question arises through whom is veterinary advice being conveyed at present to the Government of India, and why this system is bad. There is already an officer called the Agricultural Adviser, and you are complaining that a separate man should be appointed?—I think it will be a very good thing if we have a Veterinary Adviser to the Government of India; there will be some encouragement to the department. There is no plum of any sort in the department. I do not think there is any other department in the whole of the Government service which has no plum at all to attract.

41,182. But you have nothing to complain of as regards the channel through which veterinary advice is at present conveyed to the Government of India?—I know nothing about it at all. What I know is that there is no veterinary officer at present.

41,183. On page 117 you say: "The chief obstacles in dealing with contagious disease, so far as my short experience of district work has allowed me to form any opinion at all are: (1) Delays in reporting outbreaks of disease"?—Yes.

41,184. In this Province, I take it that the Veterinary Department is under the control of the provincial authority?—It is really a question to be answered by Mr. Quirke. It is under provincial authority, yes.

41,185. If that is the case, why cannot the Provincial Government rectify the system so as to eliminate the delay? In other Provinces probably the District Boards are responsible for the delay; but here the delay could be easily rectified, as the department is directly under the control of the Provincial Government?—I think the Provincial Government have spent a great deal of thought over this particular question, and they have not succeeded in getting rid of the delay.

41,186. When you mention that this is an obstacle, have you any definite suggestion to make as to how the Provincial Government can remedy it?—No, I have not.

41,187. You have not thought about that?—It has not been my business.

41,188. You advocate legislation in order to meet the obstacles, chiefly in connection with rinderpest. Supposing this sort of legislation were proposed or drafted, what would be your penal clause in that legislation?—You are rather going beyond my province. I am not a lawyer.

41,189. I am not asking you the exact terms. I am merely asking you about your idea of penalty. When you suggest legislation, naturally it is a corrollary that the next step which follows is how to penalise?—The Government will have to arrange that. I am not prepared to draw up a scale of punishment.

41,190. I want to know whether you would confine yourself only to fines or whether you would also suggest imprisonment?—It is for those who draw up legislation to suggest what they think best.

41,191. I am just pushing your suggestion to its logical conclusion for legislation?—Other countries already have legislation with regard to disease. The proposed legislation might run on the same lines.

41,192. On page 118 you say: "All schemes depend for success on co-operation between all departments and officers concerned. In my opinion measures should be taken to insure adequate co-operation in the future." Do you mean to suggest that there is not that adequate co-operation at the present moment among the various departments?—I certainly do.

41,193. *Sir Ganga Ram*: Do you get a demand from other Provinces for breeding bulls?—A large demand.

41,194. And you cannot meet the demand?—No.

41,195. You cannot even meet the demand from this Province?—No.

41,196. Supposing you find the necessary money, you can double or treble the output; but the question is one of land?—It is a question of land, yes, and of staff.

41,197. How much land have you got now?—40,000 acres.

41,198. How much of it is irrigated?—About 2,000 acres.

41,199. Is there any chance of increasing the irrigated area?—We have an extension scheme now before the Government and it involves increase of canal water.

41,200. From the Western Jumna?—Yes.

41,201. None from tube-wells?—I think that experts are of opinion that tube-wells would not pay.

41,202. Have they worked out any scheme?—I was not here at the time. A trial tube was put down by the Agricultural Department.

41,203. Barring those 2,000 acres, the rest is *barani*? It is for grazing.

41,204. You keep it for grazing?—Yes.

41,205. You do not grow any kind of *barani* crops? A very small quantity.

41,206. Cannot you grow any *barani* crops? No; I get much more if I grow grass.

41,207 For grazing your own cattle?—Yes.

41,208. You do not allow outside cattle to graze?—Sometimes we cannot stop it; we have got no fencing.

41,209. Have you ever thought of the food value of sugarcane megasse?—No.

41,210. Are you aware of its food value?—No.

41,211. *Sir Thomas Middleton*: You are breeding a definite type of cattle?—Yes.

41,212. How does this type of cattle differ from the best specimens of the Hariana breed?—I call this an improved Hariana.

41,213. You have shown us this morning that you started from a foundation stock which was mixed and you are doing your best to get rid of that mixture and to get back to the Hariana type?—Yes.

41,214. With reference to the thick tail which was mentioned, that is largely associated with a thick skin?—Yes.

41,215. Is there any reason to suppose that your cattle are any more thick skinned than the Hariana?—One of the points with regard to the Hariana breed is that it has a very fine, silky skin.

41,216. Your younger stock appeared to me to be fine skinned?—We are trying to breed fine skinned ones.

41,217. So that the present Hissar breed we might distinguish as Hissar-Hariana?—Yes; I call it improved Hariana.

41,218. To what extent is inbreeding called for in your operations?—Very heavily.

41,219. Have you noticed that any ill-effects follow inbreeding?—No.

41,220. What methods are you adopting to avoid ill-effects in the future?—I am getting new blood from the Rohtak type of cow.

41,221. Is your herd divided into sections?—Yes, to a certain extent.

41,222. So that you do not anticipate as years go on that you will suffer from ill effects?—I shall take steps to avoid it.

41,223. You have that definitely in view?—Yes.

41,224. What is your view on the early-maturity question? We have heard it said that we should aim at an early maturing breed in India?—I think it will be highly dangerous. I think what India requires is a good strain of working and famine resisting quality.

41,225. *Sir Henry Lawrence*: What is the period you regard as the best period for maturing?—About 3½ years or 4 years. It should not breed before 3½ years.

41,226. What is the age in England?—They go for early maturity, but it is for beef, to get them on to the market as quickly as possible.

41,227. *Sir Thomas Middleton*: I would like to have your view on what one might describe as the dual-purpose-breed policy. Supposing you did

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breed stock from 1,000-gallon cows and sent them out as bulls in the villages round here, what would be likely to happen?—I should hope that their stock would produce more milk.

41,228. You say that great difficulty is experienced in getting food for the cattle you have. The 1,000 gallon type would want very much more food and must have it. Do you think that it is safe to breed a high milking capacity into these cows?—I do not know; it depends on markets for milk, &c.

41,229. I am thinking now of providing for the villager of this district who is breeding draught cattle. He wants to raise good draught cattle, and he wants a little milk for himself?—In that case he does not want the 1,000 gallon type of cow.

41,230. And the progeny would be of very little value to him?—Yes, unless he can rear or sell milkers.

41,231. So that you will agree that moderation is wanted in the aim to secure a dual-purpose animal?—Yes.

41,232. For what length of time can a bull safely be used in a village?—The average period is about up to ten years old. We have gone in for a very heavy castration campaign.

41,233. At present your bulls are so few in villages that no difficulty arises, but bulls kept for ten years in a village would be serving their own progeny and you would have in-breeding?—Yes.

41,234. And if that is carried on to a considerable extent by people who are not expert breeders, the dangers would be considerable?—Yes, but we have not yet reached that stage.

41,235. You consider that the term for which they are at present used is quite safe?—Yes.

41,236. I should like your view as to the number of breeds which ought to be stimulated in a country. We have a very large number of breeds in India. Do you think the policy ought to be to establish herds of all the various types, or do you think that we should try to select the best types and concentrate on providing a large number of bulls from such selected types?—That is a question which requires a great deal of investigation, and it might well be tackled by the Central Cattle Bureau. I do not myself think that any one breed would suit the whole of India.

41,237. To take your own Province, how many types do you think would serve the Province?—I think four would be enough; Hariana, Montgomery, Dhanni and Baghnari types.

41,238. On page 118, you point out the danger of sending out bulls unless the progeny is inspected. What steps are taken for inspection as regards the progeny of the bulls you send out?—That is done by the Civil Veterinary Department.

41,239. Do the District Boards employ any officer to see that the cows for whom they provide bulls are properly looked after?—Not that I know of; we are very short of staff.

41,240. We were told by a witness with great experience in the United Provinces that Indian pastures were never overstocked, the point being that there was always plenty of grass in the rains and none afterwards?—What happens to the grass?

41,241. He said that the grass dried up in any case towards the end of the cold weather and there was none. Your observation, I take it, is that your pastures are invariably overstocked?—Yes; there is no chance of the grass not being eaten up. It is all eaten early, before it is half grown.

41,242. Are there any districts in the Punjab in which the fields are enclosed by hedges?—I do not know much about the Punjab.

41,243. Would you agree that if grass borders to tilled fields are to be of any use the fields must be enclosed?—I do not know; you can get a certain amount on bunds and so on in these *barani* districts.

41,244. While the crop is on the fields the cattle cannot get to the grass; but when the crop has been harvested these bunds or field divisions are found covered with a good crop of grass, and the cattle grazing on the stubble get the benefit of this grass?—The fields here are enclosed with thorn fences after sowing; there is no permanent fencing.

41,245. You say you have no evidence of the absence or deficiency of mineral constituents in feeding stuffs in this tract?—I think there is every evidence of its presence.

41,246. You get all the bone you want?—Yes.

41,247. I was told at Karnal the other day that since they have been using minerals the cows have been breeding much more regularly?—Yes, that is so.

41,248. Are you troubled with irregular breeding?—No; here it is purely a question of feeding.

41,249. *Mr. Roberts*: Do you think the export of bulls would help the industry at all?—I think it would in the long run.

41,250. Could you tell us what would be the approximate cost of rearing a bull up to three years of age? It is generally in the neighbourhood of Rs.200; it would perhaps be a little more or less; the grazing, of course, is free. I am talking about the cost of such a bull on our farm.

41,251. I was not thinking so much of the cost of a bull on this farm. Have you any idea of what it would cost the people in this part of the country to rear a bull up to the age of three years, including grazing and everything else?—I can work it out for you.*

41,252. You cannot give us a figure off hand? You sell to Government and the District Boards at certain rates, do you not?—Yes, I nearly always make a profit on this farm, because my cattle live very much on grass. As a matter of fact my cattle breeding here is almost always profitable.

41,253. What I want to get at is this, that it seems to me that unless you get outside agency to assist, any direct efforts by Government are only going to touch the fringe of the problem. So far as I can make out, you supply about two or three per cent. at most of the bull requirements in the Province. The point is, therefore, unless something can be done to make it profitable for outside agencies, such as farmers or co-operative societies, to take it up there is not much hope of much headway being made in this direction?—The only hope I can think of is that the price should rise to what I may call an economic level.

41,254. I just want to get at that. Would you find out the cost of rearing a bull up to say 3½ years of age?—Yes, I will. My figures are subject, of course, to the grazing element, which would vary the cost enormously. This farm has been paying in the matter of breeding through selling cattle at the District Board rate of Rs.250.

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* Information subsequently supplied by Mr. Branford. "Actually in this district bullocks are rarely, if ever, stall fed from birth up. For varying portions of the year they subsist on grazing alone. They are usually worked a little after about three years old or even earlier and so some return is obtained for the feeding, apart from the money received for the animal if it is ultimately sold at four years old. It is impossible to estimate exactly what actue costs of rearing are; personally I estimate that most of the four year old bullocks sold in Hariana fairs have eaten fodder in the course of their rearing to a greater value than the average amount realized for them when sold. The question remains, is the value of the work done by them sufficient to have made the rearing of them profitable?"

41,255. Would you agree with the statement that the fact that cattle breeding does not pay is the biggest factor which operates against the improvement of cattle in this country?—I do not think that it is the biggest factor; it is one of the biggest factors I should say.

41,256. Do you think this question is more important than the economic question?—Both are important; at any rate until the economic aspect is settled, I do not think one would be justified in overemphasising the other, because the only people who are going to breed cattle will be the people who have got big areas of land.

41,257. Major Vanrenen in his evidence criticises the grant of some 12,000 acres made in the Lower Bari Doab Division for cattle breeding. His point is that if this land is sold and the interest used, according to his calculation you would get some three lakhs per annum from these 12,000 acres; and he suggests that Government might purchase from the public, say, 200 bulls at Rs.1,500 each per annum in order to encourage or subsidise general breeding. Would you care to give your opinion on such a proposal? Do you think it would be a good thing?—That proposal would certainly have to be considered. What guarantee am I going to get that the 1,500 rupee bull is going to have any pedigree behind him?

41,258. You may not get good results in the beginning, but do you not think that a policy of that kind would encourage outside agencies to take up cattle breeding?—It might; but I should want some guarantee as to what they were breeding.

41,259. Of course you may not get any guarantee in the beginning; and as a matter of fact there is no great attention paid at the moment to pedigree, but if there was a definite policy of that kind, that is to say, Government actually paying a high price for a definite number of animals per annum, it might stimulate private enterprise?—Yes, it might; but I am hardly prepared to answer that question definitely. I would want to consider it very carefully first.

41,260. Will you admit this then, that it is very desirable to get private agency to take up the work?—Yes, it is very desirable.

41,261. *Professor Gangulee*: In reply to Mr. Kamat you said that you desire adequate co-operation between all the departments. Have you any suggestions to make as to how that can be brought about?—I do not know that I am sufficiently conversant with the Government arrangements. I do not know what our Financial Development Commissioner has to do at present. I think that it is his duty to co-ordinate the departments.

41,262. It is purely a question of finance?—No. Staff and method.

41,263. On page 120, you make a suggestion to the effect that Government should buy fodder. Do you think that is feasible?—Yes.

41,264. Do you think it would pay Government?—I do not, and I think I have said so in my note.

41,265. Do you grow all the fodder you require here in your farm?—On rare occasions, in famines, I have had to buy. Normally we grow all fodder required on this farm.

41,266. *Mr. Calvert*: Would you let us know what is the rainfall here on your farm?—13·5 inches.

41,267. *Sir Thomas Middleton*: You have on the farm 364 working bullocks. What rations do you allow them?—Four pounds of grain and as much fodder as they will eat.

41,268. For how many months is it necessary here to allow the full ration for full work?—They get the corn ration all the year round, and they get no fodder if they are grazing.

41,269. Is there any period of the year during which a large number of bullocks would be grazing?—Yes; from about August up to the present time

the bullocks have been getting nothing else but fodder; during the winter they have got to be fed.

41,270. You have told us that you have very good grazing land on the farm. What is your best grass?—The best grass is *Pennisetum cenchroides*. There are other grasses, but this is the main grass they eat.

41,271. *Sir Ganga Ram*: You have stated that there is no absence of mineral constituents, and that the condition of the cattle is very much better as a result of their being given mineral constituents. May I know what you give?—I do not use bonemeal.

41,272. What about salt?—Yes, I use salt. I give a ration of rock salt. It is always before my cattle.

41,273. Can you say how much you give on an average every day?—I do not give them more than they want; they like rock salt, and they lick that salt as long as they like.

41,274. *Sir Henry Lawrence*: You were asked how you could advocate cattle breeding if it does not pay. Can you suggest any conditions in which it could be made to pay? I think the gradual rise in prices will eventually make it pay. It pays where you can get sufficient grazing; it pays me because I have got sufficient grazing; it pays in this district to breed cattle, because they have sufficient grazing, or can get a large amount of their fodder for nothing; it does not pay if you have to stall-feed.

41,275. It is only under certain conditions that it will not pay; under other conditions it will pay?—In some conditions it will undoubtedly pay.

41,276. Is one of the desirable conditions the diminution of worthless stock which compete with the good stock?—Undoubtedly; the diminution of worthless stock would have an enormous effect at once because there would be more grazing for the good ones, stall-feeding would diminish, and the price of fodder would go down. At present cattle which are rubbish are competing and putting up the price of fodder.

41,277. What is the most effective method of bringing about this diminution of useless stock?—I do not know.

41,278. Is it not the castration of bad bulls?—Castration will undoubtedly have some effect.

41,279. I think you said just now that bulls round this district are castrated?—Yes, but those are the good ones; they are the good calves which are likely to make good plough bullocks.

41,280. Are there still a large number of useless bulls running free in this district?—I am not very familiar with the district, but I should say there are; there are generally one or two in this bazar which are absolutely deformed and useless.

41,281. You say on page 118 of your note that the issue of bulls without a scheme for the castration of unfit male stock is not much use. Have you any such scheme for enforcing this castration?—Yes, Mr. Quirke will give you full figures. We have no scheme for enforcing castration, but we manage to get an enormous amount done by persuasion and propaganda; no force is used that I know of.

41,282. You do not find the local zamindars unwilling to castrate?—That depends. That again is a question for Mr. Quirke. The zamindar is gradually being educated up to it; our castration scheme is one of our great successes as a department; I have nothing to do with it; that is purely Mr. Quirke's work.

41,283. If that scheme succeeds the prospects of making cattle breeding pay will be improved?—Undoubtedly, but then the absolute necessity for more bulls becomes more and more important; if we castrate the bad ones we must breed some good ones to take their place.

(The witness withdrew.)

Mr. R. Branford.

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Mr. T. F. QUIRKE, Chief Superintendent, Civil Veterinary Department, Government of the Punjab.

Replies to the Questionnaire.

QUESTION 15.—VETERINARY.—(*a*) After a considerable experience of the present system of control, I have no hesitation in saying that the Civil Veterinary Department should be independent.

The present system unnecessarily adds to the work of the Director of Agriculture and only delays the disposal of cases which could readily be decided by direct approach to the Financial Commissioner, Development.

The office work of the Chief Superintendent under the present system absorbs almost his entire attention; it could be reduced very considerably by allowing direct communication with the Financial Commissioner, Development. The work of the Civil Veterinary Department has now advanced to a stage when a more expeditious method of dealing with its proposals is essential for the purposes of efficiency.

(*b*) (*i*) Dispensaries in this Province are not under the control of the local District Boards. The pay of the Veterinary Assistant in charge is paid out of Provincial Funds whilst all other expenses in connection with the maintenance, etc., of dispensaries are borne entirely by the local body concerned. The necessary funds are placed at the disposal of this department, which is the advisory authority on all matters affecting the management of dispensaries.

The existing arrangements are working satisfactorily.

(*ii*) On the whole we have little grounds for complaint in this respect. District Boards are generally willing, so far as their resources permit, to provide additional veterinary dispensaries as soon as the local demand arises. Our difficulty at present is to meet the demand for the large number of additional veterinary dispensaries asked for by the District Boards.

(*iii*) As noted in 15 (*b*) (*i*) above, dispensaries are already under provincial authority.

(*c*) (*i*) Agriculturists are beginning to more fully realise the advantages of the free veterinary treatment available at our dispensaries. Especially in those areas where attention is now being paid to improved methods of breeding livestock, the demand for veterinary help is steadily increasing. It is expected that as the value of livestock increases, there will undoubtedly be bigger demand for veterinary service.

In this Province we aim at providing a larger network of dispensaries, one in each *zail*, to facilitate the treatment of sick animals under hospital conditions and are endeavouring to bring veterinary treatment within the reach of the poorest zamindar. The difficulty in arranging for the care and feeding of animals whilst under treatment is undoubtedly one of the biggest obstacles to the freer use of our dispensaries. This is specially felt by zamindars at present owing to the long distances of many villages from our dispensaries, which number only 205 for the entire Province.

The provision of an efficient hospital staff is another important factor in helping to popularise veterinary dispensaries. I feel convinced that on the efficiency of our veterinary staff depends to a very large extent the rate of progress of veterinary development in this country. There is a good deal of evidence available of what progress can be effected even in backward areas in popularising the work of dispensaries through energetic and efficient Veterinary Assistants. The greatest care should, therefore, be taken in the recruitment of our subordinate establishment, those drawn from the zamindar class having most influence in the villages and suitable for the work of this department.

(*ii*) The system of maintaining touring veterinary dispensaries was tried in this Province but proved very expensive and was found unsuited to local conditions.

(*d*) The obstacles in dealing with contagious diseases are many:—

(1) The apathy of the people, who generally regard visitations of disease as the will of God.

(2) Religious objections to measures for the control of disease.

(3) Ignorance of the systems of inoculation and protective vaccination as means of dealing with disease.

(4) Ignorance of the methods of spread of contagious disease.

(5) Absence of any powers to enforce measures for the protection of livestock against disease.

(6) Increase in the number of cattle fairs throughout the province.

In making suggestions as regards legislation for contagious disease amongst livestock, I am guided entirely by the progress, if any, already made in this direction for dealing with human contagious diseases in this country.

I think, however, that some effort should be made within municipal areas where they are in a position to enforce measures directed for the control of disease. It should at least be possible to prevent an animal suffering from rinderpest being driven from Delhi to Peshawar along the public roads, with free entrance to every village *en route*, the department responsible for dealing with contagious disease being obliged to stand powerless when disease is carried from village to village whilst it mobilises its staff and follows in the tread of the disease with its serum.

Failing legislation I think Deputy Commissioners should insist on *lambardars* of villages reporting disease promptly, they should also hold *lambardars* and *zaildars* responsible for inoculation of cattle whenever outbreaks of disease occur in their villages. A good deal could also be done through village panchayats to improve matters in this respect.

I specially mention *lambardars* and *zaildars* as they are dependent upon Government for their position amongst the villagers, they would be generally willing to give more active support if pressure was brought to bear upon them. On the other hand, they should receive adequate official recognition for any particular help given by them.

I personally entertain hopes of the different village co-operative societies being more active supporters of the department in its efforts to deal with disease. Education of the people to the importance of control measures is the basis of success in combating any contagious disease.

(*e*) There has not been any serious difficulty in securing sufficient serum provided adequate funds are available for its purchase from the laboratory. Our only difficulty has been that sufficient funds are not forthcoming to purchase sera and vaccines in the quantities required in this Province. The department, however, realises the heavy expenditure involved in the supply of sera and vaccines. I must add that I am far from satisfied with the conditions under which one is obliged to employ these products in this country.

(*f*) In this Province there is very little real opposition; the only serious obstacle to preventive inoculations is the indifference of the people towards taking any effective steps to deal with disease. In certain districts, such as the Kangra and other hill districts, the village zamindar is generally unwilling to inoculate his cattle until the disease has actually claimed victims amongst his own particular animals. He is not prepared to anticipate events after seeing the death of his next-door neighbour's cattle. Local conditions of this kind make the economic employment of serum impossible.

(*g*) Yes; I consider that the provision of further facilities for research into animal diseases is highly desirable.

(*a*) and (*ii*) I attach the greatest importance to the setting up of provincial veterinary research institutions where the officer in charge would be in close touch with the district staff of the department. These provincial institutions could not, however, replace an Imperial Institution of the Muktesar type, where diseases of All-India importance should be particularly dealt with.

(*h*) I anticipate that the Muktesar Institute will receive more generous financial support and, therefore, it will be in a position to attract a more efficient staff of research officers. On this account I would recommend that as far as possible special investigation should be conducted by officers of the Muktesar Institute.

(*i*) Yes; I strongly recommend the appointment of a superior veterinary officer with the Government of India.

The Veterinary Service in an agricultural country like India cannot hope to effect much progress or make any headway in providing an efficient organisation whilst it continues to be treated as an unimportant side line and relegated to an inferior position amongst the other services.

The service badly needs direct representation with the Government of India in order to co-ordinate the work of the different Provincial Veterinary Services.

In view of the efforts being made to improve the livestock industry of the country, the time is approaching when the problem of contagious disease must be seriously tackled.

It is not reasonable to expect that any widespread and systematic effort can be made by stock owners to improve the quality of their stock which may at any time be swept away by disease.

There will, therefore, be many occasions on which the advice of an experienced veterinary officer, with practical experience of village conditions, will be needed by the Government of India in the future.

Oral Evidence.

41,284. *Sir Henry Lawrence*: Mr. Quirke, you are Chief Superintendent of the Civil Veterinary Department?—Yes.

41,285. How long have you held that office?—Since early in 1920, when I took over from Colonel Farmer.

41,286. How long have you been in the department?—I am in my thirteenth year of service.

41,287. Have you been in the Punjab all the time?—Yes.

41,288. You have just heard Mr. Branford's statement about the castration of unfit bulls; could you tell us something about the success that the department has achieved in that direction?—I think our numbers last year were about 182,000; I remember noting in our annual report for 1924-25 that we do as many castrations as they do in the whole of the rest of India. 195,427 scrub bulls were castrated throughout India, of which as many as 109,432 were dealt with in the Punjab.

41,289. Have you met with any opposition in any particular part of the country?—We do in Hindu districts, but it is nothing very serious.

41,290. Is there less opposition in the Mahommedan districts than in the Hindu districts?—Yes, we always expect a certain amount of opposition from Hindus, but the opposition is gradually decreasing with the introduction of the Italian method of castration which does not offend the susceptibilities of the Hindus at the moment, with the result that it has become increasingly popular.

41,291. How long is it since you introduced the Italian method?—It is about in its third year now.

41,292. You have done 182,000 in one year?—Yes.

41,293. What number do you think would be sufficient to cope with the situation satisfactorily?—I am afraid it is rather difficult to say for a large province. I am not able to give at the moment any definite opinion. In our castration work we pay particular attention to those villages where our District Board bulls are located. We try to remove all opposition to our District Board bulls in the different villages.

41,294. There are some 15,000,000 cattle in the Province, are there not?—Yes, I think so; this number includes buffaloes.

41,295. Of that number, what proportion would be unfit bulls?—At the moment our policy is of course to consider none but our District Board approved bulls as meeting with our approval for the purposes of cattle improvement. The supply of these District Board bulls has not been sufficient; nor have they been working long enough in the districts to justify our depending on the village male produce as fit for breeding purposes, so that we must regard the increase of District Board bulls as the criterion of our rate of progress in cattle breeding.

41,296. Would you have to work up to five or ten times your present number to have a serious effect on this problem?—Yes, I think so. We estimate our requirements at 50,000 stud bulls for the Province.

41,297. Do you think you will be able to reach that number in the near future?—I do not think so; we are not likely to get sufficient staff which would be required to control cattle breeding on such a large scale.

41,298. But if the staff were provided?—I should think we would be able to castrate about 70 or 80 per cent. of the bad bulls in the Province if we had the staff.

41,299. Do you regard that as one of the fundamental points in improving the cattle stock?—Yes; apart from any other method of cattle improvement, we should get a certain amount of very definite progress in this way; in fact we are securing marked progress by the diminution of unsuitable male stock.

41,300. Then it would be quite worth while for Government to provide the staff necessary?—Yes, we should pay particular attention to castration.

41,301. How many years would it take you to train up your men to be able to do this work?—We are training at the moment at the Veterinary College four-year course men, but they are coming out in very small numbers.

41,302. How many a year?—This year it is only about five; ten to fifteen recruits are about as many as we shall get each year during the next three or four years.

41,303. How many men have you to do the 181,000 a year that you do at present?—Our present staff is 279 Veterinary Assistants and 28 Inspectors; that is 307 subordinate staff. We have got 207 hospitals.

41,304. So that on the average each one of your 300 men does 600 castrations per annum?—About that.

41,305. So that if you had treble the present staff, you would be able to make a real impression on the Province?—Yes, I think so; we are paying particular attention to castration in this Province.

41,306. On page 138 of your note, you mention that you are far from satisfied with the conditions under which you are obliged to employ the sera and vaccines in this country. What are the points on which you are not satisfied?—The most serious is that we have no power to deal with contagious diseases. As I noted elsewhere in my written reply, a case of rinderpest

can be brought from Delhi to Peshawar and visit every village *en route* without our being able to stop its movement; that means the deliberate spread of disease from village to village. The only measure as a department we can take is to follow with our serum bottles; that in practice is the position with regard to control of contagious diseases in this country.

41,307. You have no complaint against the serum with which you are supplied from Muktesar?—None.

41,308. You are satisfied with that; it is the supply of serum from Muktesar that you are referring to at that point in your note?—Yes, that is one of the circumstances which makes the employment of sera and vaccines uneconomical in this country. One cannot expect sera and vaccines to be employed economically if people are allowed to spread disease openly. I regard the present position as regards disease control very unsound. In reply to another question I referred to the peculiar local conditions in the Kangra district; when an outbreak of disease is reported from a particular village we find that the only people who are willing to have their cattle inoculated are the people whose cattle are already infected; their next-door neighbours will refuse to have their cattle inoculated because none of their cattle happen to be victims; the result is that at any one visit of the Veterinary Assistant he is allowed to inoculate only a small percentage of the total cattle of the village, being obliged to return frequently to the village whilst the disease persists. Such conditions clearly make the employment of serum uneconomical, because it means repeated use of serum under very unsatisfactory conditions.

41,309. Have you done much with the serum simultaneous method?—No, we have not; we have had to go rather slow as regards introducing the serum simultaneous method into this Province; we are awaiting the results of that method in other Provinces. Another reason is that with our very limited staff we do not feel inclined to take it up at the moment.

41,310. Does it require some special skill?—No, it is not that, but we have so much other work on hand at the moment that it would be unwise to undertake anything further.

41,311. There again, with a bigger staff you would be able to do so?—Yes; at the same time, we should proceed very cautiously on this particular work.

41,312. On account of the risks?—On account of the risks involved in the method.

41,313. Are those risks due to inefficient handling of material or what?—They are probably risks that you cannot always provide for; for instance, one finds, in different parts of India, the disease piroplasmosis in cattle. In the serum simultaneous method you run the danger, when you are injecting virulent blood into the cattle for inoculation purposes, of also introducing piroplasmosis, and you may also have piroplasmosis as well as coccidiosis appearing in the course of the reaction, these diseases being resuscitated in the inoculated animal.

41,314. *Professor Gangulee*: Have you many cases like that?—We have not yet adopted the method in this Province, but we know that to be the experience as regards the serum simultaneous method. Our policy is to hasten slowly with regard to this particular method of immunisation in this Province.

41,315. *Sir Henry Lawrence*: Would you tell us what your views are on the subject of putting cattle breeding under the Veterinary Department?—I propose to speak from my own experience of the cattle breeding situation situation in this Province. We feel that we have done something substantial in the way of improving cattle breeding through an entirely veterinary agency, and that we are from our very training suited to take up cattle breeding and to specialise in cattle breeding if necessary. When you get a

veterinarian with agricultural experience, as most of us have, I think you have got a person who is likely to be the most suitable to tackle the problem of cattle breeding in this country, a problem which to my mind is largely connected with cattle disease. One knows that stock breeding is seriously handicapped by such conditions as sterility, shy breeding, contagious abortion, long dry periods in milch cattle, castration of the unfit—conditions which the veterinarian is particularly qualified to deal with.

41,316. Are the principles of animal husbandry taught in veterinary colleges in England?—Yes; a man properly trained as a veterinary surgeon is supposed to have acquired a particular knowledge with regard to inherited disease in animals; the only thing I claim for the veterinarian is that he is likely to be most suited to undertake problems of cattle breeding in this country. I do not claim that every veterinarian is good at cattle breeding; I am speaking particularly with reference to conditions in this country.

41,317. *Sir Ganga Ram*: Is animal husbandry part of the veterinary course at Lahore?—Yes.

41,318. *Sir Henry Lawrence*: In other parts of the world where cattle breeding is carried on on a large scale, is it usually in the hands of veterinary officers?—No, but the conditions are so different; here if you bring together any number of cattle you are immediately faced with the problem of disease; you have disease around you on all sides; one's only claim for a veterinarian out here is that he is likely to be more of a dual purpose man, and particularly suited for conditions in this country.

41,319. Do you think there is more disease in this country than in South Africa, for instance, or the Argentine?—I think so; we have disease in abundance in this country.

41,320. At one time in the United States they introduced some Indian blood in order to make their cattle more immune against local diseases?—Yes.

41,321. At that time rinderpest was very common in Texas, for instance?—Yes, we realise the value of our indigenous cattle in that they are more immune from the ordinary diseases of this country.

41,322. *Sir James MacKenna*: What is the superior staff of your department?—Three Superintendants, one of the three Superintendents has got to deal with the North-West Frontier Province in addition to North Punjab.

41,323. *Mr. Calvert*: And Delhi?—Yes. Delhi Province is under the Punjab Civil Veterinary Department.

41,324. *Sir James MacKenna*: How many Deputy Superintendents are there?—We have five; of these, two have recently been appointed; we were going on with three for some years past.

41,325. How many districts have you?—There are 29 districts in the Punjab, and Delhi is an additional district.

41,326. How do you divide up the Province amongst you?—We have divided it into the Northern circle, which includes the whole of the Rawlpindi Revenue Division; the Central Circle comprises one whole Revenue Division and part of the Jullundur Division; and the South Punjab Circle takes in the rest of the Punjab and Delhi Province.

41,327. Which part do you take yourself as Chief Superintendent?—The Central Punjab; in addition, I hold general control over the whole Province.

41,328. Is the Veterinary College under the Chief Superintendent?—No; it is under the Director of Agriculture.

41,329. On page 137, with reference to the relationship which exists between the District Boards and dispensaries, I infer from your remarks that the local bodies provide the funds and you are responsible for the

management; is that the position?—Yes. The District Boards provide the buildings, but they are largely supported by Government grants, this applies particularly to the poorer District Boards.

41,330. Do not the Local Boards take any interest in the administration?—Strictly, they have to. Before transferring a Veterinary Assistant, we have got to consult the District Board.

41,331. *Professor Gangulee*: What is your view with regard to the idea of a Central Cattle Bureau?—The principal advantage will be to correlate information as regards the different breeds in India. It will help the Provinces in case one Province wants to use the cattle of another.

41,332. In every Province they are going to have a Livestock Expert and under the existing arrangements their activities could not be co-ordinated without having a Central Cattle Bureau?—I do not see how you could.

41,333. Judging from the vast area that you have to serve you are rather under-staffed?—Yes.

41,334. Some time back I think the Government of the Punjab sent a number of students to England for training: have they come back?—Yes, some have.

41,335. Have they been appointed in your department?—I am afraid not all; some have been appointed.

41,336. *Sir Ganga Ram*: Is there scope in this Province for private practice in this line?—Not very much.

41,337. *Professor Gangulee*: Have you any definite suggestion as to how the reporting agency can be improved?—It is a question that we have considered for many years. The present agency is the *patwari*.

41,338. You make a suggestion here that *lambardars* and *zaildars* could give more active support if pressure was brought to bear upon them. What have you in mind when you say that pressure should be brought to bear upon them?—One knows the powers of a Deputy Commissioner in a district. The more interest he takes in these matters the more work can be done.

41,339. You rightly emphasise the need of educating the people to the importance of control measures. Do you do any propaganda work?—Yes, but we depend mostly on the co-operative movement for propaganda. Hitherto we used to do our own propaganda.

41,340. These co-operative societies go to the cattle fairs and carry on propaganda?—Yes. Of course their job is to do propaganda and we are hoping that every member of a society is a potential propagandist.

41,341. But do these propagandists have adequate knowledge in veterinary matters?—I think they have sufficient knowledge for discussions with the villagers.

41,342. The cattle fairs are increasing in this Province?—Yes, very considerably.

41,343. Why is that so?—It is probably due to the fact that District Boards are anxious to supplement their incomes and this is one of the methods.

41,344. These fairs are all organised?—Yes, by the District Boards, and they add much to our difficulties. You can quite understand that disease is disseminated where cattle fairs are held indiscriminately.

41,345. You have no Veterinary Research Institution in this Province, have you?—No, none.

41,346. Therefore you are unable to carry on any research, even if you wished?—Yes, with the exception of what is being done at the Lahore Veterinary College and in the Sohawa Laboratory.

41,347. A certain amount of research is going on there in veterinary matters?—Yes.

41,348. A previous witness has told us about the supply of bulls to the District Boards. Could you give us an idea as to what is the agency for the distribution to these Boards?—According to our arrangements the District Boards form cattle sub-committees for each *tehsil* and periodically these put forward the requirements of their *tehsils*. We are the agency for collecting the applications from the villagers. The applications for bulls are put up before the *tehsil* sub-committees and their recommendations are laid before the District Board, at the time of the preparation of the District Board budget the purchase of bulls is decided on.

41,349. They buy from you at a fixed price?—Yes, at Rs.250, a flat rate.

41,350. And they distribute them among the zamindars?—We are responsible for the distribution.

41,351. How do you dispose of your bulls in the farm if the demand is not forthcoming from the District Board?—Such a position has not arisen so far; the demand is always there.

41,352. I see you are in favour of legislation for the control of disease. Do you think it will be possible to set up the necessary organisation for enforcing such legislation?—It has got to be set up very slowly. The position from my point of view is that I have got to put forward our difficulties. I have to show under what difficulties we work in this country in dealing with the problem of contagious disease.

41,353. *Mr. Calvert*: Is there a large introduction of contagious disease from beyond the borders of the Province?—We generally consider there is; we generally blame particularly the bordering Indian States where little or no effective measures are taken against contagious diseases.

41,354. *Mr. Kamat*: You have heard the previous witness Mr. Branford say, with reference to the unfit animals, that their number in villages may be roughly about 50 or 60 per cent.; that is, 50 or 60 per cent. of the animals in the Province may be rubbish. As a Veterinary Officer, do you agree that the proportion of unfit animals may be 50 or 60 per cent.?—I fully agree with that.

41,355. Is that your general impression or have you gone into the question with reference to the figures of the cattle census?—That is one's general impression.

41,356. Probably you may not have studied the figures; but I will just put them before you in order that the question may be further studied. The cattle census figures show that in 1923 in your Province there were nearly fifteen million cattle?—Yes.

41,357. Out of which the young stock total five millions?—Yes.

41,358. If you exclude the young stock there remain ten millions of adult cattle?—Yes.

41,359. You know male buffaloes in this country are slaughtered; there is no sentiment about it?—Yes.

41,360. Now, if you exclude the figure for buffaloes and take into account merely the figure for bulls and cows, it comes to seven millions?—Yes.

41,361. 50 per cent. of that are useful and 50 per cent. only unfit; so we get to 3½ millions as useless cattle?—Yes.

41,362. Now, this 3½ millions out of a total of 15 million cattle comes to about one-fifth or 20 per cent. and not 60 per cent.?—I am afraid I do not follow your argument at all.

41,363. You say that 60 per cent. of the total cattle are useless?—I can talk only of this Province.

Mr. T. F. Quirke.

41,364. Yes; if the total number of cattle in this Province is fifteen millions, according to your own showing, half of them or 7½ millions must be useless?—They are not absolutely useless; they have all got a particular value in the internal economy of the Province. We do consider that the breeding and rearing of such cattle are uneconomic to the people who bred them.

41,365. You are using the term "useless" in that sense?—Yes, entirely.

41,366. It is simply a question of what pays and what does not pay the breeder, that is all?—That is one's general impression of the cattle seen in villages.

41,367. You will see the question as to what is the census of the useless cattle requires further and closer study rather than mere impressions?—Quite so.

41,368. It may not be after all 50 per cent. of the total?—Quite so. Buffaloes can be entirely excluded from this category of useless cattle and my 50 per cent. estimate does not include them.

41,369. *Sir Ganga Ram*: You told us this morning that you could not double or treble your output for want of irrigable land?—Yes.

41,370. We were told that there is a scheme for irrigating 6,000 acres; would you be able to double the output if that scheme is carried out?—Yes; the scheme provides that.

41,371. Would the increase be in direct proportion to the irrigated land?—Almost. At the moment there are so many acres under irrigation and so many under grazing. With a relatively small increase in the cultivable land we will be able to increase our output.

41,372. The total area being limited, it will reduce your grazing area?—Yes, but not to any appreciable extent.

41,373. So it cannot be in direct proportion?—No, not strictly.

41,374. Is the price of serum retarding the zamindars from inoculating their cattle for rinderpest?—No, because in this Province the Government pays for the serum.

41,375. Then why do not the zamindars make use of the serum very freely?—So they do; in fact they make use of it so much that we are not able to meet the demand.

41,376. Do you fully meet the demand?—No, on account of the big expense.

41,377. Do you advocate the reducing of the price of serum? You know the Government of India is making a huge sum out of it?—Yes; all the time when the increases in prices were under discussion we opposed them, but they were always carried; I think they were increased for particular reasons.

41,378. *Sir Thomas Middleton*: You told us that your department last year succeeded in castrating a large number of bulls. At what ages were the animals castrated?—Between six months and two years.

41,379. *Sir Ganga Ram*: Is it surgical castration?—No; it is the new Italian method.

41,380. *Sir Thomas Middleton*: Did you castrate a large proportion between six months and one year?—Yes, quite a large proportion.

41,381. Does it require a qualified Veterinary Surgeon to use this Italian instrument?—No.

41,382. Could you increase your staff of castrators?—We are doing that.

41,383. You told us that when you introduced bulls into the district you try if possible to get rid of all the competitors?—Yes.

41,384. What happens in the case of the Brahmini bull?—I almost prefer not to tackle this particular question. I am afraid they do not come under our head of success in castration, but we do a certain number of them.

41,385. Do they come under your compulsory castration?—There is no such thing as compulsory castration.

41,386. So that they remain as competitors?—Yes.

41,387. *Sir Henry Lawrence*: Are they a large number?—Pretty large for the country.

41,388. *Mr. Calvert*: In the east, not in the west?—Yes, quite so.

41,389. *Sir Thomas Middleton*: What general methods of inspection do you follow to ensure that the progeny of the selected bulls and cows are properly looked after?—Under our system we have a network of hospitals; I think they number at the moment 217. Each Veterinary Assistant has got in his charge a certain number of bulls working in his particular part of the district and he is supposed to do regular inspections of them, he maintains a register showing when he inspects these bulls and so on. These are examined by the other officers, the Deputy-Superintendents and Superintendents.

41,390. Supposing in a particular village the Inspector reports that a bull is serving over 50 per cent. of uneconomic animals?—We have not yet been called upon to deal with such a situation but we might suggest to the District Boards that the bull be transferred. We have not got very much power; there are a lot of things which we could do if we had power to improve matters in this respect.

41,391. Do the District Boards watch the state of affairs closely?—We find that in the Hariana districts, including Hissar, Gurgaon and Rohtak, and also in the Dhanni districts where we have concentrated on cattle breeding, the District Boards are beginning to take a very active interest in the question of cattle breeding.

41,392. You claim, I think, that the Veterinary Officer's early training has specially suited him to the work of cattle breeding. Do you not put it rather high? What Veterinary College did you go to?—Dublin. We are up against this question of control and we want to know the reason why cattle breeding should be taken away. The Veterinary Department would naturally want to know, if the authorities are dissatisfied with them, whether they have done something radically wrong which might warrant the change of policy.

41,393. During your course at Dublin and elsewhere you do get a certain number of lectures on animal husbandry but that is after all quite a small part of your course. Your technical course occupies the greater part of your time. Do students have opportunities at any of the veterinary colleges of seeing much of cattle in health?—Yes, it is part of the training of a Veterinary Surgeon to see cattle in health.

41,394. There are not very many seen about the veterinary hospitals?—We are not entirely confined to the college during the four years' training; college facilities provide opportunities for students to see healthy cattle on farms as part of their training and those of us who have been brought up on farms have naturally had ample opportunities.

41,395. You have pointed out the need for legislation and you are well aware of the difficulties. But you make one suggestion which is that there should be power to stop the movement of cattle along the public roads. Supposing it were possible to enforce some regulation preventing animals being driven along the public roads, would the result not be to send them off the roads right into the village tracks and to make things worse?—I do not think so.

41,396. There would be no possibility of enforcing a standstill order in this country such as is enforced in Britain?—It would be impossible.

41,397. I do not see that you would be much further forward if you had the public roads barred?—My suggestion was that diseased animals should be prevented from leaving one village and going into another. I am not making any definite recommendation in this respect, but I am simply showing what the present position is with regard to the question of dealing with these diseases.

41,398. I see your difficulty, but what I do not see is any method of enforcing a standstill order?—As I say, I am not making any recommendations, but simply explaining to the Commission the present position.

41,399. *Sir James MacKenna*: In Burma we can deal with cattle in that way.

41,400. *Sir Thomas Middleton*: Can you enforce it?

41,401. *Sir James MacKenna*: Yes.

41,402. *Mr. Calvert*: In the Punjab can you not control the movement of cattle across the bridges, etc.?—Yes, if we had the power we could. I am simply stating the position to show how hopelessly difficult the whole thing is.

41,403. *Mr. Roberts*: Is there a Cattle Diseases Act in this Province such as there is in Madras?—Certain diseases have been notified, such as surra, glanders, dourine, epizootica, South African horse sickness and lymphangitis in equines; we have got the power in certain districts to catch affected animals and destroy them.

41,404. Have you powers to stop fairs being held in the districts?—No, but the Director of Agriculture has got the power to recommend; I do not know if he has got the power to stop them.

41,405. As regards the question of breeding cattle, do you agree with the view that the main hindrance is the fact that cattle breeding does not pay, or is it your view that the main difficulty is the religious prejudice of the Hindus?—I suppose there is a bit of both in it. If an industry does not pay, it naturally ceases to be attractive to the people engaged in it.

41,406. You would not go so far as to say that this is the main difficulty?—I suppose it is one of the main difficulties.

41,407. With the spread of irrigation in the Punjab we shall within the next few years have about fifteen million acres, more or less, under irrigation, and that will be at the expense of the breeding tracts?—Yes.

41,408. Is it your opinion that in future cattle breeding will have to be resorted to more and more in the cultivated areas?—No; up to the present time the resources of the cattle breeding tracts have not been sufficiently organised. My own opinion is that if the development of the present cattle breeding tracts was well organised they would supply the rest of the Punjab very well.

41,409. Could you give us an idea as to what you mean by organisation?—Take districts like Rohtak, Hissar and Gurgaon; we would have an organisation in these districts such as the Remount Department provides in selected horse breeding districts; similarly we would have selected districts for cattle breeding. We would need to have a big castration campaign and also undertake the question of fodder provision in these tracts. Insecurity of fodder is the principal difficulty in the way of progress in these tracts.

41,410. Do you think the type of animals can be much improved?—Yes, and I believe that Government can concentrate on the cattle breeding tracts for the supply of their bulls and plough cattle for the rest of the Punjab.

41,411. You can produce them much cheaper here, can you not?—Yes.

41,412. *Sir Henry Lawrence*: Would the cattle of this part of the Punjab be suitable for the rest of the Punjab?—No. Besides this cattle breeding tract, we have also got the Dhanni tract, which supplies the north of the Punjab, down to districts like Sialkot. Then you have got the Hariana tract, which supplies all the south-eastern Punjab.

41,413. And the two together can supply a greater part of the needs of the Punjab?—Yes; and there is the third tract, called the Dajjal area, for such districts as Mooltan and Dera Ghazi Khan.

41,414. *Mr. Roberts*: In answer to Sir Ganga Ram, you said that an increase in the irrigated area here would give you material for increasing almost in proportion the number of animals turned out. Is it your idea in these breeding tracts that you can increase the number by increasing the irrigated area?—Yes.

41,415. I do not quite follow how in that case these districts can be in a better economic position than the other cultivated areas?—I think the average holding in these districts is larger than in the rest of the Province, and, as you know, the country is *barani* at the moment and the holdings are large.

41,416. And the unirrigated areas must still be of no use except for cattle breeding?—Yes, quite suited for cattle rearing.

41,417. You have no figures, I suppose, of the cost of rearing cattle?—We can work that out on the farm book prices. The book valuation, showing the cost of the animals as they are brought up on the Hissar farm, is fairly representative of what it would cost the ordinary zamindar to rear these cattle.

41,418. Would you give us a definite note? You apparently have a definite idea in your mind that you can organise these tracts for giving us all the cattle that are required. Would it be possible to show more definitely than appears in the note put forward how it is to be done?—If you read the note on cattle breeding in the Punjab, which is part of the Government memorandum, you will find that I specially recommended that the resources of the cattle breeding tracts should be developed, as I considered that to be the first step towards cattle improvement in the Punjab. You are likely to get the quickest and the best results from that method.

41,419. With regard to your organisation of the district, your men, I take it, are attached to the veterinary hospitals everywhere?—Yes.

41,420. Do you regard that as sufficiently mobile when big problems with regard to contagious diseases crop up?—The great advantage of the veterinary hospital is that everyone knows where to find the hospital. With the itinerant system, you send your man out into the interior, and nobody knows where to find him when he is wanted. Our object is to increase the network of hospitals so as to include a workable area for each Veterinary Assistant.

41,421. *Sir Henry Lawrence*: Speaking of the necessity for provincial research, what particular diseases do you think require research at the present time here?—Take the sheep question: we consider that between 80 and 90 per cent. of the mortality amongst sheep is due to parasites, and we feel that quite a lot could be done with regard to the prevention of such mortality. Then there are other local problems.

41,422. Are you doing anything for camels?—Yes, a certain amount is being done at the Sohawa Laboratory.

41,423. Have you had a Camel Expert at any time dealing with surra?—Yes.

41,424. Have you still got him?—No, he has retired; but we have got a Deputy Superintendent doing the job who was formerly working under him.

41,425. How have you solved the question of surra in camels?—We have not yet solved the question; it is still alive, and more work is necessary on that question. There is also immense scope for work as regards surra in horses.

41,426. *Mr. Kamat*: I should like to ask you one question about the system prevailing in this Province with regard to the relationship between District Local Boards and your department and also the Provincial Government. You say the pay of the Veterinary Assistants is borne by the Provincial revenues?—Yes.

41,427. And the District Local Boards pay only for the upkeep of the dispensaries?—Yes.

41,428. And as regards transfers and promotions?—That is done by the Provincial Government.

41,429. Is this system working satisfactorily?—Yes.

41,430. Have you compared the system prevailing, say, in the United Provinces with your system?—No, but I have heard about their difficulties.

41,431. You think your system is better?—As things are happening in the Punjab, we are quite happy with the present arrangements.

41,432. You want that the District Local Boards should contribute a definite percentage of their revenues for the maintenance of your department?—As the department is responsible for cattle breeding, we feel that something definite should be done by the District Boards in order that we may know beforehand what we can do towards replacing casualties occurring amongst our stud bulls. At the present moment our energy is dissipated in writing and re-writing to District Boards to provide funds.

41,433. As a requisite of the success of this scheme you also maintain that Government should give grants to supplement the percentage contribution made by the District Local Boards?—Yes.

41,434. Your point is that the Provincial Government should have control and they should also give contributions?—Yes; the District Boards should be encouraged to maintain interest in the cattle breeding question by insisting on their bearing portion of the expenditure.

(The witness withdrew.)

The Commission then adjourned till 10 *a.m. on Monday, the 28th February*, 1927, *at Lahore.*

Monday, February 28th, 1927.

LAHORE.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc. } (*Co-opted Members.*)

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries.*)

Mr. D. MILNE, C.I.E., I.A.S., Director of Agriculture, Punjab.

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION.—Agriculture is taught in—

(*a*) the Agricultural College, Lyallpur, which has been the chief centre of agricultural education in the Province since 1909, and now gives courses for the B.Sc.(Agri.) and M.Sc.(Agri.) degrees; also a number of non-University courses to meet various needs of the community.

(*b*) the Khalsa College, Amritsar, which since 1923 has given a course for the first two years of the B.Sc.(Agri.) degree.

(*c*) certain middle and high schools in the Province where it forms an optional subject.

To give some idea of the position of affairs in this Province, I will first give a brief history of the Punjab Agricultural College and Research Institute, the Khalsa College, Amritsar, and agricultural education in schools in the Province.

Agriculture in Colleges.—The Punjab Agricultural College and the Research Institute was opened in 1909 at Lyallpur as already stated, and had chemical, botanical, entomological and other laboratories, library, herbarium, museum, etc. It cost about 4 lakhs of rupees. The students were boarded on the estate as they are at present. Twenty acres of land were set aside as a students' farm where students were made to grow plots of different crops, and do all connected operations with their own hands. Land was required for several purposes connected with the opening of the Institution, and by then the Agricultural Experimental Farm was left with an area of 260 acres, of which 100 acres were for experimental and demonstration work—the remaining area was farmed by tenants. On this experimental farm, the students studied the farm animals, were given demonstrations with various indigenous and modern agricultural implements, were kept in touch with the agricultural experiments carried out by the department and received training in agricultural operations too extensive to be carried out on their own plots.

The Botanical Section which was started in 1907, when the Economic Botanist was appointed, had taken over 65 acres of land. On four acres of this area a teaching collection of plants of biological and economic interest

was begun. Eight acres were being put under fruit experiments; thirty acres were reserved for botanical work on cottons and wheats, and the remainder for botanical work on other crops. Among other things the students received here tuition in crossing, selection, testing of varieties of crops and other work connected with the evolution of improved types.

The College began its work with only a three years diploma course in English. This included a training in practical agriculture with theoretical and practical instruction in such sciences as are of direct assistance to farmers, *i.e.*, Botany, Entomology, Chemistry, Physics, Veterinary Science, Land Revenue System of the Province, etc. The standard of education for entrance to the course was the University Matriculation Examination or its equivalent. Men who went successfully through the course were eligible for posts of Agricultural Assistants and such like in the Department as well as for employment on private farms.

In 1910 a very small workshop was opened to facilitate repairs, etc., of apparatus required in the Institution, and from 1912-15 a few lectures on agricultural engineering were sometimes arranged for.

In 1912 a dairy with twenty cows was started to enable the Professor of Agriculture to teach the students practical dairying as part of the diploma course. In the same year a six-months vernacular course of practical farming was opened for young men who wished to take such a course.

In 1914 the three years Diploma course was changed into a four-years Diploma course divided into two parts. Part I extended over the first two years, and was devoted mainly to practical agriculture. It was a course complete in itself and qualified men for employment in the lower ranks of the Agricultural Department, or for farm managers on private estates, etc. A leaving certificate was given to those who left College at this stage. Part II of this course extended over the remaining two years and included the scientific training already mentioned.

From 1915, on the appointment of an Agricultural Engineer to the Department the students began to get a very useful course in Agricultural Engineering including land surveying, handling of tools, working in wood and iron, the use of machinery, and other agricultural engineering matters with which modern farmers should be acquainted; also they are put in touch with problems connected with the evolution of improved implements, water lifts, tube wells, etc.

In 1916 a Rural Economics course of one month's duration was started. It is attended by all recruits to the Indian Civil Service, Extra Assistant Commissioners, Canal Officers and Subordinates, staff of the Co-operative Department, etc. The object of this course is to show these officers something of the nature of the work that is being done at the Agricultural and Research Institute so that they might be able to direct farmers where they should apply for help when in a particular difficulty; also that they might be better able to assist the staff of the Agricultural Department with their district work, should they require their help.

In 1917 the college was affiliated to the Punjab University and the four years' Diploma course was remodelled to form the present four years' course for the B.Sc. Degree in Agriculture. After experience with the four years' Diploma course it was found advisable to make instruction in science and in practical agriculture go hand in hand as far as possible in the new degree course, as it had done in the old three years' Diploma course. To enable us to meet, as far as staff and other facilities would permit, the wishes of those who cannot, or do not desire to go through the Degree course, a two years' Leaving Certificate course was started. It was arranged that in the first year of this course the students should take the first year classes of the B.Sc. (Agri.) Degree, and in the second year they should join a class specially arranged for them in which they would devote most of their time to the study of practical agriculture.

In 1918 a vernacular course of one year's duration was started for certificated teachers of the Education Department to enable them to teach agriculture in rural vernacular middle schools.

In 1924 a course extending over 1½ months for *lohars* (village blacksmiths), etc., was started. The instruction given includes oil engine driving, running repairs, maintenance of the simpler forms of improved implements, etc. The course was started as it was found that the introduction of modern agricultural implements and machinery, including ploughs, reapers, harrows, sugar mills, oil engines, etc., etc., was being greatly hampered on account of dearth of men who understood them, and who could effect simple repairs.

Short courses of dairying, practical agricultural, etc., have also been arranged.

At present the following courses are given at the College:—

(*a*) A four years' University course in English for the B.Sc. (Agri.) Degree.

(*b*) A course in English of not less than 1½ years for the M.Sc. Degree in Agriculture.

(*c*) A two years' certificate course in English.

(*d*) A six months' vernacular course of practical training in agriculture.

(*e*) A one-year course for certificated vernacular middle school teachers, to enable them to teach agriculture in those schools.

(*f*) A short course in rural economy for newly joined members of the Indian Civil Service, Extra Assistant Commissioners, Canal Officers and Subordinates, staff of the Co-operative Department, etc.

(*g*) A blacksmith class of 1½ months' duration.

(*h*) Other miscellaneous short courses for which there is a growing demand.

The College Syllabus and University Calendar give further details of these courses.

With the gradual development of the courses of instruction, there have been additions and improvements to the laboratories and other parts of the Institute; for example, a new wing has been added to the Chemical Section; a new workshop has been built and the Engineering Section has been greatly expanded. The Botanical area has been extended to 120 acres, and the Experimental Farm is now about 500 acres. There is accommodation now for 200 students in the College and, as will be seen from the statement on page 36, about 50 students are now admitted each year to the main course. Of these, 36 seats are reserved for the Punjab, five for Indian States and nine for other Provinces. The North-West Frontier Province in the first place and Sind in the second have prior claims on the places reserved for other Provinces. Extensions to the College are greatly needed in many directions and are being provided for in the five years' programme of development of the Department. The total expenses which students have to meet, inclusive of cost of living, College fees, etc., in the degree and leaving certificate courses are about Rs.40 to Rs.50 per month, and the vernacular class about Rs.10 per month.

The Khalsa College, Amritsar, as already stated (*vide* page 38) teaches agriculture up to the first examination in agriculture, *i.e.*, the first two years of the course for the Degree of B.Sc. in Agriculture. It is an Arts College, but is provided with a farm of 50 acres in extent on which practical agriculture is taught to the students. The scientific part of the course is taught in the College laboratories. The first batch of about a dozen students of this institution sat for the first examination in Agriculture in April-May, 1925, and in April-May of the present year nine students sat for the same examination. The system of agricultural education in Arts Colleges up to the stage of the first examination in agriculture has its drawbacks, however.

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It is not possible to discuss this system fully here, but one or two points may be mentioned. One objection is that the students would have to proceed to another College to complete their studies for the agricultural degree, joining that College in the third year, a system which has been repeatedly tried and is now strongly condemned by many authorities on agricultural education. Again these Arts Colleges could only be a success if equipped with Professors of experience of the agricultural needs of the Province and of the application of the different sciences to agricultural work; have suitable farms, laboratories, apparatus, herbarium, library, etc., and be kept in touch with current work by touring; by carrying on experiments on their farms, etc. If therefore each intermediate college must be equipped in this way to give a sound agricultural education, the cost to the country will be immense.

Besides the question of cost, and still more important for the progress of agricultural education, Agricultural Colleges with their staff of specialists and their superior equipment ought to be able to give a far more efficient agricultural education than Intermediate Colleges. The establishment of a specialised college highly equipped for the teaching of agriculture and then increasing the number of such Colleges when necessary, is the line of development which has proved most economical and successful in other countries and this is the line of development which the Department advocates.

There is also the question whether good courses in the general sciences connected with agriculture, such as Botany, Chemistry, Zoology, Physics, etc., should be given in the Intermediate Colleges, and thus shorten the course of agriculture at the Agricultural College. This is another matter and raises questions of considerable difficulty in the Punjab. For example, we find that the boys here must be three years at least at an Agricultural College, studying practical work and the application of science to agriculture, before they can get a good grounding in the subject. Therefore this would mean a course for five years' study from the Matriculation stage, and would probably put an agricultural degree beyond the reach of the sons of ordinary farmers.

As regards the popularity of the Agricultural College, Lyallpur, and the success of its students in finding employment we find, looking back on its history, that there were 400 applicants for entrance to its diploma course when it opened in 1909, that there was not a single applicant for admission in 1913, that in 1914 there were 58 and that the number rose to over 200 in 1917.

The figures showing the number of applicants and admissions from 1917 onwards are given below:—

Statement showing number of applications for admission to the English course (B.Sc. Agriculture degree and Leaving Certificate) in the Agricultural College, and numbers admitted during the past nine years.

Year.	Applications.			Admissions.		
	Agriculturists.	Non-Agriculturists.	Total.	Agriculturists.	Non-Agriculturists.	Total.
1917 ...	78	124	202	23	16	39
1918 ...	100	125	225	37	17	54
1919 ...	173	92	265	47	9	56
1920 ...	202	66	268	50	4	54
1921 ...	151	77	228	45	9	54
1922 ...	210	90	300	43	10	53
1923 ...	151	29	180	48	5	53
1924 ...	83	25	108	47	9	56
1925 ...	108	32	140	50	14	64

The rush to get into the college when it opened was probably due not to a belief that anything of practical value could be taught in a college to practical agriculturists, but largely to the expectation that successful students would rapidly find their way into the various Provincial Services which deal with agricultural work. People were disappointed except in so far as the subordinate services of the Agricultural Department were concerned, and the drop in the number of applicants followed. In the main, the numbers of applications which have been received from 1917 onwards have followed the improvements made in the pay and prospects of the members of the Subordinate Agricultural Service, and the number of subordinate posts in the Agricultural Department which became available.

It will be seen from the statement above, however, that we have usually had far more applications for admission to the college than we have had facilities to take in.

As regards employment, most of the students who have passed successfully through these courses have been taken into the service of the Agricultural Department; a few have gone into other Government Departments or to manage their own lands or the lands of others, and some have found employment elsewhere (*vide* page 54).

Early in the history of the College however we realised that it, and even the Agricultural Department, could not live long unless our graduates showed that they had learnt something of real money value there; consequently strenuous efforts were made when evolving courses in the various science subjects to work into each subject as much as possible of the application of the science to Punjab agricultural problems.

The result of these efforts is, we are pleased to say, that men who have gone successfully through a diploma or degree course are gradually gaining the confidence of the farmers as the years pass and are doing much to awaken the agricultural community to the value of a scientific agricultural education.

We are now faced with large developments in the Agricultural Department and this will attract more students to the college; also other departments the work of which is closely connected with agriculture are prepared to employ graduates to an increasing extent. The latter step must be an advantage to the Punjab where agriculture is the basis of all prosperity, but the most encouraging feature is an increasing demand from private farmers and others connected with agriculture for the services of men trained in the Agricultural College. This is a compliment to the value of the training given to students at the college, but the demand is chiefly for those who have had some years' practical experience of farming after taking their degree or diploma. It would, however, be impracticable to lend a considerable number of men already in Government service to landowners for long periods, and in order to help us to overcome this difficulty a scheme has been put forward to Government by which a number of students will be given, for a period of five years, an area of 75 acres of canal-irrigated land which they will farm under the supervision and tuition of the Agricultural Department. It is hoped that by the end of five years they will gain sufficient experience to fit them for the posts just mentioned and will also have acquired sufficient confidence to take up farming on their own account.

At present the best brains among the agricultural classes are being diverted to professions more lucrative than agriculture, and it seems advisable that every endeavour should be made to induce men to take an agricultural education.

The students for the courses given in the Agricultural College are drawn from all over the Province and when they leave the college they impart information of value to agriculturists with whom they come in contact. The result of this and the fact that farmers have pocketed extra profits in hard cash by using the Agricultural Department's seeds, implements,

methods of cultivation, &c., has been the creation among agriculturists of a desire to improve agriculture. Their change of attitude in this direction forcibly strikes anyone who attempted to get these men to adopt improvements twenty years ago. In those days most people regarded the zamindar as a hopeless case, now zamindars are regarded as far from hopeless. Many zamindars call for aid from the Agricultural Department; the call is increasing day by day, and we cannot satisfy their demands. Obviously, then, the Agricultural Department has laid a very valuable foundation, not only for its own work, but for other Departments, the work of which is connected with agriculture. It is extremely difficult, however, to get a measure of the money value of this to the Province.

Agriculture in schools.—The question was taken up in earnest in 1917, and after discussion it was decided that special agricultural schools were not the best line of action as by joining such a school all careers other than that of agriculture would be definitely closed to the boys. Obviously the correct policy is to leave the final choice of a career open to young people as long as possible. It was therefore decided to introduce agriculture as an optional subject in rural schools, and the vernacular rural middle schools were chosen as the most promising field of operation. The work is carried on chiefly in District Board schools subsidised partly by the Education Department and is supervised by the Education Department with the help and advice of the Agricultural Department.

Since 1918 senior vernacular certificated teachers have been sent to Lyallpur Agricultural College for one year's training in the course specially designed for that purpose, after which they teach the subject in the schools referred to above. When employed on teaching work these men are entitled to an allowance of Rs.10 per mensem each in addition to their ordinary pay. Their work is inspected by an officer of the Education Department who holds the post of Assistant Inspector of Agriculture in schools and who has been through the old three years diploma course at Lyallpur. This officer has his headquarters at Lyallpur and works under the general direction of the Principal of the Agricultural College there.

Up to the end of 1923 the schools at which agriculture is taught were provided either with a school farm of three to five acres, or a school garden of about ¼ acre area. The farms are usually equipped with bullocks, a set of agricultural implements, buildings for the storage of seeds and implements and for the housing of bullocks etc. The estimated capital cost for starting one of these farms is Rs.3,500. In the case of these farms difficulties were met with, as the price of land rose greatly after the war and it was found impossible to purchase land at the sanctioned estimates, viz., Rs.250 an acre; it was not always easy to get suitable land in the vicinity of schools; people began to expect too much from agricultural teachers who had only one year's training in agriculture; there were often considerable deficits in the budgets which District Boards found it difficult to meet, etc. In spite of these difficulties, however, the progress achieved was considerable though slow. At the close of the year 1922-23 there were 44 middle schools teaching agriculture. Four to six periods of 40 to 45 minutes each are given per week to the subject in these schools.

A circular issued by the Director of Public Instruction in September, 1923, announced some important changes in the policy of agricultural education in schools. Among other things it encouraged the institution of school gardens up to a maximum of ½ acre in area; Government to contribute towards the initial expenditure on these up to a maximum of Rs.300 per plot, and towards the net deficit on the working of a plot up to a maximum of Rs.30 per annum for a period of five years from the date of commencing the work.

The result of the circular was that the number of schools teaching agriculture rose by the end of the year 1925 from 44 to 67. Of these, 26 were

school farms of three acres or more, and 40 were school gardens. In the past year (1926) the number of vernacular middle schools where agriculture is taught has increased from 67 to 80. About 53 of these have school gardens and 27 have school farms attached. Therefore the increase in the past year was practically all in school gardens. The demand for school gardens is rapidly increasing, and District Boards which were previously apathetic are now keen to start agricultural education by means of these.

School gardens are more popular than school farms for many reasons. For example, their initial cost is about one-tenth the cost of a school farm, and there can be no great annual deficit in the accounts. Suitable land is more easily secured, and the teacher can give farmers a great deal of information regarding the principles underlying the various farm operations, plants and how they live, crop and cattle pests, etc., etc., while they are not exposed to competition with farmers as regards farm management—a subject at which the farmer has had many years' experience, and at which the teacher with one year's training in agriculture is not able to hold his own as a rule. It is considered that the teaching of agriculture in schools is of great importance as it reaches masses of people who never attain the matriculation standard, and creates in them a thirst for further knowledge and a desire for agricultural improvement. From a statement sent to me by the Assistant Inspector of Agriculture in schools, it appears that this year out of an approximate total of 8,700 boys who attended the middle classes in schools where agriculture is taught some 6,600 are taking agriculture. Considering that agriculture is an optional subject, I think this is a most excellent record and a convincing proof of the popularity of the subject.

There are also a few high school centres at which agriculture is taught. These centres are maintained by Government. In addition to this, agriculture is now taught at a few private schools.

The one year course in the Punjab Agricultural College which qualifies senior vernacular certificated teachers to teach agriculture in middle schools is attended by 32 teachers this year. The number of teachers who receive this training will doubtlessly increase with the increasing demand for agricultural instruction in rural vernacular middle and other schools, and arrangements for the training can be made at Lyallpur.

I will now make a few remarks regarding the specific points raised in question No. 2.

(i) The supply of teachers is reasonably sufficient for present needs. A Fruit Specialist, a Fodder Specialist, a Bacteriologist and a Cerealist who have recently been recruited, will each give to students a number of lectures on the particular piece of work on which he is engaged; also further Specialists which it is proposed to recruit will do the same. This should tend to raise the standard of instruction given at the College.

Additions are being made to the buildings of the Punjab Agricultural College, Lyallpur, as required. With the increased number of admissions to the College, the hostel and teaching accommodation in the Institute is taxed to the very uttermost at many points. To ease the situation a new wing for teaching purposes was added to the Chemical Block of buildings only last year, and additions have just been made to the Court of Wards Block of the hostel. Also the building of a new hostel has been started to accommodate an additional 120 students and other extensions to the institution are in hand which will help to increase the working accommodation; for example, the building of the eastern wing to the Chemical Section which will accommodate research workers will relieve congestion in the central portion of that section, and the building of the much needed insectory, which is about to be started, will relieve congestion considerably in the Entomological Section.

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(ii) I consider that the Lyallpur Agricultural College should be developed a great deal before another institution for higher agricultural education is opened in any other part of the province. Important reasons for holding this view are that the facilities for giving practical and higher education are expensive, and that much more value can be got out of one institution well equipped than out of a number of scattered institutions on which the same amount of money has been expended.

(iii) Yes.

(iv) At the Punjab Agricultural College there are always more applicants than can be admitted *vide* statement on page 153. Also the number of boys taking agriculture in schools is good *vide* page 156.

(v) I think that the main incentive which induces young boys to study agriculture in schools is that it is a subject which they know something about, and that it provides a relaxation from the study of reading, writing and arithmetic which are to them more irksome subjects.

As regards lads who enter the Agricultural College, the main inducement is Government service in one Department or another. Incentives which I feel will arise are employment in private service in this province, in Indian States, &c., &c., I feel also that the increased profits which advanced farmers are getting from their lands will soon create a desire for higher agricultural education in the minds of young lads in order to develop their own estates. Most of the men who have taken a Degree, a Diploma or a Leaving Certificate have so far been employed by the Agricultural Department but agricultural education is of a value in all Government Departments which deal with agriculture. This is being realised as shown by the following resolution passed at a meeting of the Provincial Board of Agriculture held in the Punjab Government Civil Secretariat on 1st August, 1924:—

(*a*) That, for direct recruitment to the posts of *Zilladars* in the Irrigation Department, candidates must possess at least the leaving certificate of the Punjab Agricultural College.

(*b*) For direct recruitment to the posts of Sub-Inspectors in the Co-operative Department preference should be given to men who possess at least the leaving certificates of the Punjab Agricultural College.

Similarly, for direct recruitment to posts of Inspectors in the Co-operative Department preference should be given to men who hold the B.Sc. degree in Agriculture.

(*c*) That, for posts in the Revenue Department and for appointments as Estate Managers, candidates with agricultural education should be given preference.

(vi) Yes. It is important that this should be so. Lads brought up on a farm understand the problems and difficulties of farmers in a way which is hardly possible for young men who have not had that experience. Consequently they have more sympathy with farmers in their difficulties and are less likely to misapply what they learn at an Agricultural College. Such misapplications do much harm as they give farmers occasion to scoff at the whole subject of scientific agriculture.

Again farmers are far more disposed to listen to the advice of a man whom they know has gone through the mill, than to one who has not.

In my opinion an important factor in the success achieved by our demonstration and propaganda work in the districts of this province is the fact that the Agricultural Assistants who are in immediate charge of that work have been mostly drawn from the ranks of the middle-class farmer, and consequently have the qualification just mentioned in addition to a sound training at the Lyallpur Agricultural College.

(vii) At present students enter the Punjab Agricultural College at the Matriculation stage and go through a four years' course for the degree of B.Sc. (Agri.). There is a complaint that the standard of knowledge of

English which the students possess when entering the Agricultural College is too low; therefore the question is under consideration, of raising the standard of entrance to the F.Sc. stage and then giving a three years' course for the B.Sc. Degree in agriculture. If this change is made the English, Mathematics, and Elementary Science would be taught in Intermediate Colleges, and the applied Sciences would be taught in the Agricultural College. An advantage would be that the boys would come into the Agricultural College at a stage when they could understand lectures more easily but as the English taught in the Agricultural College during the present fours years' Degree course is the same as is taught in the F.A. and F.Sc. courses of the Punjab University—poetry only being omitted—they would be taught the same amount of English.

A disadvantage however, would be that the lads will have three years' training only in practical agriculture instead of four as at present. This is a point of some importance in a country like India where labour is apt to be looked down upon. Another disadvantage in the proposal, is that a farmer will have to educate his son for five years after the matriculation stage, instead of for four as at present in order to give him a B.Sc. Degree. This will tend to raise a high class agricultural education beyond the reach of the ordinary farmer and to me this appears a matter of great importance.

To overcome the difficulty there is a proposal to institute a number of scholarships for farmers' sons of real ability.

If the standard of entrance to the College is raised the course will have to be radically readjusted. The whole question is being looked into.

I may also mention here that I am keen to see the introduction of a number of short courses on special subjects for men already engaged on farming or work connected with it.

(viii) Kindly see my above note on agricultural education in schools (page 155).

(ix) I give below a summary of particulars *re* the boys who have passed out of the Punjab Agricultural College, Lyallpur, since 1912.

Degree or Diploma or Certificate.	No. passed.	Private farming.	Government service including Co-operative and other Departments.	Private service and Indian State service.	Private business other than Agriculture.	Research Scholars and Students.	Remarks.
L.Ag. ...	66	6	49	5	3	—	3 died.
B.Sc. (Ag.) ...	113	3	86	11	2	7	2 England returned. 1 not known. 1 died.
L.C.	136	7	86	14	4	1	15 not known. 9 died.
Total ...	315	16	221	30	9	8	31

(x) For this purpose it is essential to show how farming can be made a more remunerative business, and how a farmer's life can be made less of a drudgery. An important factor in this will be the spread of agricultural education which will teach farmers how they can develop their estates to the best possible limit, combined with the research and demonstration work done by the Agricultural and allied Departments, the improvements in

irrigation and transport facilities, the means of communications, &c., &c., which are taking place in this Province.

(xi) Yes. A number of specialists have been added to the staff of the department recently; also an M.Sc. degree has been established, and a scheme to give students further practical training in agriculture after going through their Degree course is under consideration,—(*vide* my general note above on agricultural education in colleges (page 150.))

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) For field and demonstration work the Province is divided into five circles with farms as shown below:—

Circle.	Districts.	Farms.	Area in acres.
1. Hansi ...	Hissar, Gurgaon, Rohtak, Karnal, Ambala, Ferozepore and Delhi Province.	Hansi Agricultural Experimental Farm.	589
		Rohtak District Board Demonstration Farm.	40
		Jallalabad Estate Demonstration Farm (Ferozepore District.	100
		Guru Har Sahai Estate Demonstration Farm (Ferozepore District).	52
2. Gurdaspur...	Gurdaspur, Amritsar, Sialkot, Gujranwala, Rawalpindi, Jhelum, Attock, Gujrat, Shahpur, Simla, Ludhiana, Hoshiarpur, Jullundur, Kangra, and the Lahore Tahsil of the Lahore District.	Gurdaspur Agricultural Experimental Farm.	161
		Sargodha Experimental and Seed Farm.	500
		Chillianwala Seed Farm (District Gujrat).	250
		Beas Government Demonstration Farm (Amritsar District).	43
		Gujrat Government Demonstration Farm.	50
		Jullundur District Board Demonstration Farm.	50
		Sialkot District Board Demonstration Farm.	50
		Khalsa College Demonstration Farm, Amritsar.	50
		Ludhiana District Board Demonstration Farm.	54
3. Lyallpur ...	Lyallpur, Jhang and Sheikhupura.	Lyallpur Agricultural Experimental Farm.	671
		Students' Farm	78
		Risalewala Cotton Research Farm.	200
		Botanical Section Experimental Area.	120
		Risalewala Seed Farm ...	878
4. Montgomery	Montgomery, Multan (that portion including Lower Bari Doab Canal Colony and the perennial area of the Nili Bar), Lahore (that portion known as the Chunian Colony).	Montgomery Seed Farm ...	250
		Raewind (District Lahore) District Board Demonstration Farm.	46
		Kahuta (Bara Farm) ...	558
		Shergarh (District Montgomery) Seed Farm.	275

Circle.	Districts.	Farms.	Area in Acres.
5. Multan ...	Multan (less Lower Bari Doab Canal Colony and the perennial portion of the Nili Bar), Mianwali, Dera Ghazi Khan and Muzaffargarh.	—	—

In addition to these farms there are the following three grantee farms connected with problems of general agriculture:—

Name of farm.	Year given.	Area in acres.	Purpose for which lease given.
1. Convillepur farm, Montgomery.	October, 1915.	3,000	For growing pure seeds of cotton and wheat.
2. British Cotton Growing Association, Khanewal.	August, 1920.	7,500	For growing pure seed of cotton and assisting marketing of improved varieties.
3. S. Jogendra Singh's farm, Iqbalnagar (District Montgomery).	December, 1915.	2,000	To collect data on how far steam cultivation can be economically employed in the Punjab and to grow and multiply cotton and such other seeds as the Department may wish.

There are also two co-operative and a few private farms which are run under the advice of the Department of Agriculture.

A map showing the locations of Government and other farms is attached.*

On the experimental farms work in connection with the testing of the relative merits of different types of crops, seed selection, evolution and testing of new implements, researches in connection with rotations, work on the efficacy of manures, &c., &c., is carried out. The main function of the demonstration farms is to demonstrate convincingly what seeds, implements, methods of cultivation, &c., &c., are the most profitable for the locality. Seed farms are chiefly for the multiplication of pure seeds, but a good deal of testing and demonstration work is also done on them.

All these farms are open to visitors. They are shown round in parties and the work in progress is explained to them. Also demonstrations of improved implements are given and the handling and adjustment of these are explained to those who desire this.

The grantee farms have been a great help to the department. The Convillepur farm has not only multiplied the department's improved seeds, kept them pure, provided records of comparative outturns, &c., but has also shown that yields of crops well above the average of the Province, and good profits, can be got from very mediocre land when farmed on modern and strictly commercial lines.

On the farm of the Hon'ble Sardar Jogendra Singh at Iqbalnagar detailed records of the costs of power cultivation have been kept which are of great value to the department in connection with advising people

* Not printed.

thinking of embarking on power cultivation for their lands. Two points that have been brought out clearly on this farm are, that power cultivation without the means to interculture crops gives very unsatisfactory results, and that with interculture the yields are very greatly enhanced.

The British Cotton Growing Association farm at Khanewal is also fulfilling the very important purpose for which it was established, and has demonstrated that improved methods of agriculture on good land will give yields and profits far in excess of those now got by farmers in the locality.

Demonstrations on the lands of ordinary farmers were early found to be an excellent means of convincing farmers of the value of improved seeds, implements, methods of cultivation, &c., &c. If a new type of seed is to be tried, a field of as uniform land as possible is selected, and divided into two or more plots, alternate plots are sown with the new type of seed and the others with the local seed. All the plots get the same treatment as far as possible, and comparative results are got in due course. The facts that the test has been made on the farmer's own field and that he has performed all the agricultural operations connected with the test himself, do more to convince him than anything else we have tried. Such plots are finding great favour with farmers and we now have nearly 300 of them. This is all that our present staff can supervise.

For many years now we have had itinerary demonstration parties who have done very good work. In such cases an Agricultural Assistant or a *mukaddam* has a set of improved implements which are carried on a cart from village to village, demonstrating the working of these implements by tilling plots of farmers' lands. The use, handling and adjustment of these implements is explained to the people at the same time.

In order to popularise improved implements the department gives out a number of these to farmers who wish to try them, and these may be left with the farmers for a season, who buy them at the end of the trial.

Concentration work in villages has also been in progress for the past four years. In these cases special attention is paid to certain villages with a view to completely modernising their agriculture. Obviously much more can be achieved if a whole village adopts the same seeds and methods than can be achieved where only scattered holdings do so, and the object of this work is to make these villages examples to others of what can be done in the way of improving their agriculture. This work requires extra staff, of course, but wherever the department has been able to afford staff to deal with the work, the progress has been extremely satisfactory.

The Co-operative Department has organised "better-farming" societies. A society of this sort is composed of a number of zamindars who undertake to farm their lands strictly in accordance with the advice of the Agricultural Department, including the use of improved implements, seeds, &c. There are about thirty of these societies in existence at present.

The Agricultural Department carries out measures for the control of crop pests as far as staff will permit and gives demonstrations of these in farmers' fields and gardens. They include methods of spraying, the supply of cotton boll-worm parasite boxes, rat extermination work, etc.

On occasions where large numbers of farmers meet, such as at cattle fairs, etc., demonstrations of improved implements are given, and improved seeds and other produce are exhibited. These are accompanied by short lectures illustrated by magic lantern views. Ploughing matches are held on these occasions, where the District Boards concerned offer prizes. In such competitions ploughs and other improved implements are often given as prizes by firms who sell agricultural implements. The first ploughing match open to a whole Civil Division was held at Palwal in Gurgaon district of the Ambala Division last winter in conjunction with the District Board Cattle Fair. Prizes to the value of Rs.600 and contributions towards the expenses

of competitors were given by Government; the Railway Companies concorned gave concessions in the railway freight of competitors' bullocks; the District Board, Gurgaon, contributed to the expenses, and made most of the necessary arrangements, etc. Competition was keen and the work good. It is proposed to extend these ploughing matches as far as possible, as such competitions are valuable aids in popularising improved implements, and convincing zamindars of their capacity to handle them.

The department also distributes printed leaflets on subjects of agricultural interest, and twice a year it publishes a departmental magazine entitled "Seasonal Notes." These are all published in English and the vernacular.

A travelling cinema had just been fitted up and it is proposed that this shall tour throughout the districts, screening improved methods of agriculture used in India and elsewhere. We are also preparing lantern slides of educative value to agriculturists, and a set of these will be given to the agricultural staff in each district. That staff will exhibit these slides and deliver explanatory lectures at schools and gatherings of farmers.

Agricultural associations are now 11 in number. These are being found to be increasingly useful as the interest taken in agricultural matters is sharpening. They keep the department in touch with the local needs of of multiplying improved seeds, demonstration and propaganda.

There are also a Provincial Cotton Committee and a Provincial Board of Agriculture which deal with questions of wider interest.

The spread of agricultural education and the fact that farmers have pocketed large profits in hard cash from one or other of the many lines of work taken up by the Agricultural Department has opened the minds of the agricultural community to the possibilities of increasing the income from their lands, and has created a demand for help which the present staff is quite unable to meet. The measures described above function as a whole. The Deputy Directors now find their circles too large, and they have not nearly enough staff to handle the district work that flows in upon them. To help them in this respect, it is proposed in the five years' programme of development of the department that there should be eight in place of five circles in the Province, with the following staff:—

One Deputy Director of Agriculture and two Extra Assistant Directors of Agriculture for each circle.

One Agricultural Assistant and two *mukaddams* for each tahsil.

As regards the farms, it is proposed to have a 500 acres farm at the headquarters of each circle in the next five years. It is also proposed to have a district farm of 100 acres at the the headquarters of every district where there is no experimental farm, and the further development of small farms in localities not otherwise provided for is under consideration.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*b*) The number of farms and staff on district work are to be greatly increased and the methods of propaganda referred to above will be developed and improved as time goes on to fit the advancing capacities and demands of farmers. I have recently issued orders to Deputy Directors of Agriculture to make the plots on their experimental and demonstration farms in long narrow strips of five to ten yards wide as a rule, and at least five times as long as broad with a standard variety in similar strips on either side. Each test is to consist of at least three strips of the variety to be tested with a standard plot on either side of each, and as many more repetitions as possible. A sketch plan is to accompany the report on each experiment showing positions of water channels, shelter hedges, or other sheltering

obstacles, roads and anything else likely to affect the experiment. Notes will be given regarding the quality and evenness of the land in the test plots, the cultivation and irrigation given, the character of the seasons, and anything else which might affect the outturn or quality of the crop got.

For cottons the attached form is to be filled up. I am also pressing for the same methods to be employed on demonstration plots on ordinary farmers' lands. The idea is to increase the severity of these tests. To lay out plots in this way naturally entails a considerable amount of extra labour, but I do not anticipate much difficulty in getting farmers to adopt these, as they have already fingered substantially increased profits by accepting varieties of crops recommended by the Agricultural Department, and are becoming keen to make their tests as severe as possible in order to get definite information as regards the value of the improvement offered.

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Variety of cotton.	Square number.	Plot number.	Bed area in acres.	Propor-tion of length breadth.	Cultiva-tion.	Dates of irriga-tion.	RAINFALL.		CONDITIONS OF PLANTS.		PICKINGS.	OUTTURN.		General remarks.
							Dates.	Amounts in inches.	Per cent. stand of plant.	Height of plant.	Dates.	Quantity of picked kapas.	Actual from plot.	Actual per acre.	

NOTE.—To get the per cent. stand of plants estimate the numbers of plants required to fill the blank spaces on the plot and deduct from the ideal number of plants for a plot of that size.

Experience has shown that very useful results have been got by this method and that it is preferable to counting the total number of plants in the plot and then comparing that with the ideal number.

2. If the heights of the plant in a bed vary greatly, the proportional areas under the different heights of plants should be shown. For example, $\frac{1}{3}$ of area 4½ feet high and $\frac{2}{3}$ of area 3 feet high.

3. A plan of the area showing sizes and shapes of beds, positions of shelters, water channels, etc., must accompany this statement.

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Demonstration and Propaganda.—(*c*) We have no trouble in inducing cultivators to accept our advice

(*d*) Kindly see (*a*) above.

QUESTION 4.—ADMINISTRATION.—(*a*) It is extremely useful for specialists working on the same subject in the various Provinces to meet and discuss their problems. This should take place more often than at present. By such meetings and discussion workers can often reduce the difficulties which they have to face, and greatly accelerate progress of their work. Their meetings also tend to co-ordination of the work. The sectional meetings held at Pusa serve this purpose, and such meetings might be instituted for all major subjects, and be held annually. They might be held not only at Pusa, but at any suitable centre in India where the sort of work under consideration is carried on. The place of meeting might be varied from year to year, so that the various members of the sectional meetings would see the work done by other men working on the same problems. This is a matter of great assistance to workers.

The Central Government could help Provincial Governments by having a bureau of information on the various important crops in India.

If any arrangement could be made between the Central Government and the Provinces whereby capable and trained experts could be available for work in a Province when required, it would be an advantage. This has been done in the past in some cases, for example, Dr. Annett worked as Agricultural Chemist in the Punjab from April 15th, 1912, to November 18th, 1912, and Mr. Grove worked on Entomological work in the Province from 30th January, 1914, to 26th April, 1915. Before the Reforms were introduced Pusa used to keep a staff of supernumerary officers under training who were available for work in the Provinces when needed there. This was an extremely useful arrangement as Provinces got trained men capable of taking up independent work.

The Provinces have benefited greatly by original research carried out at Pusa in the past, the results of which have been published in their various publications. I feel that there is room for expansion of the research work that may be undertaken at Pusa even with the expansions which have taken place, or are contemplated in Provinces. To my mind there is no harm in two institutions working on the same problem. Indeed this state of affairs is often of the greatest assistance, as the one checks the work of the other and makes each more careful regarding the accuracy of the work done; also even if two men are working on the same problem, the work will take a bias according to the particular inclination of each worker and few problems are taken up which do not become so wide that one researcher becomes unable to tackle all its useful phases. It must not be forgotten that India is a Continent and that the Provinces are as big as some countries; for example, the Punjab is larger than the whole of Britain. In many problems there are great advantages in working them out on the spot, as local conditions often play a very important part in them. For example, a particular cotton may do very well in one Province, but may not grow at all well in another; a wheat may be suitable for one Province but not for another, and so on and so on. Indeed we find that a particular type of cotton, wheat or other crop may be useful for one *part* of a Province and not for another. Similarly pests and diseases of crops are susceptible to local conditions. In my opinion facilities for research work in more than one centre in every Province will be gradually provided to meet the increasing demand for these.

The Central Government could take a more active part in such matters as the export and import duty on agricultural produce, trade relationships with other countries, protection of India from infection by plant and cattle diseases, etc., etc.

(*b*) See (*a*) above. Such an officer would be deputed by the Central Government to serve under the Local Government concerned, and should

be controlled by that Local Government while he serves in the Province. Any major problem in a Province—botanical, chemical, zoological, etc., etc., can be put under an officer deputed to the Province by the Central Government. As the work would only be of a temporary nature it seems to me that only a very limited number of researchers could be kept by the Central Government for this purpose.

(c) Both the Agricultural and Veterinary Departments have done very good work (vide their annual reports) but extensive developments are required and are being arranged for (vide the five years programme of development). The question of recruitment of a large number of men to the staff has now to be faced, and properly qualified men are essential if progress is to be made. It is recognised the world over that it is of extreme importance to fill research posts with men of the highest possible qualifications and how to secure such men is a problem which would well repay consideration.

(ii) The Railway authorities have a programme of development which they will doubtlessly lay before the Commission.

(iii) Similarly the Secretary of the Communications Board will be able to lay the extensive programme of developments of communications by road and feeder railways, proposed for the province.

(iv) At present the Meteorological Department keeps the following records:—

(a) Daily humidities of the atmosphere at 8 a.m.
(b) Daily wind velocities and directions at 8 a.m.
(c) Daily maximum and minimum temperatures, and
(d) Daily rainfalls at the following stations in the Province:—

(1) Hissar,
(2) Ambala,
(3) Ludhiana,
(4) Lahore,
(5) Sialkot,
(6) Rawalpindi,
(7) Khushab,
(8) Lyallpur,
(9) Montgomery, and
(10) Multan.

The data collected are extremely useful, but the sudden and severe reduction in the yield of the cotton crop this year impressed on me the necessity for more close meteorological records being kept at representative stations.

A summary of the information which has so far reached me from my staff regarding the cotton troubles referred to above show that the reduction in yield was caused roughly as follows:—

American cotton prices reached the unprecedented maximum of Rs.2[illegible] per maund (82½ lbs.) of *kapas*, and the *deshis* Rs.20 in the year 1924. No crop that the farmer grew, paid him so well; therefore every endeavour was made by farmers to grow as large an area of cotton as possible in 1925-26 but prices fell rapidly until in the past summer they reached Rs.8 per maund for American and Rs.7 for *deshis*. In September-October when farmers needed irrigation water to prepare land for sowing *toria* and wheats, wheat grain was selling at Rs.5 per maund approximately and toria at about Rs.8 approximately. Therefore they were better paying crops than cotton, and farmers naturally put less irrigation water on to their cotton crop, than they did for preparing their land for toria and wheat. Except in the more rainy parts of the Province, the cotton crop looked a bumper one till the first week of October when dry winds blew from the south-west and did great damage by desiccation of the cotton plants, the damage being greatest wherever the fields were not well watered and were

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unsheltered from these dry winds. In the wetter parts of the Province considerable damage had been done to *deshi* cotton by rains in August and September.

It is a matter of considerable importance to the agricultural community that such happenings be diagnosed correctly, and to investigate the cause properly, we ought to have records of humidities, wind velocities and directions throughout the 24 hours of the day. I have asked the Director of the Meteorological Department if this can be arranged for.

(vi) Recognising the possibilities of wireless telephony, Mr. Brownlie, Agricultural Engineer to Government, Punjab, turned his attention a few years ago to experiment in this direction with the result that musical and other entertainments in Rome, Paris, Vienna and Moscow were heard at Lyallpur with great clearness on several occasions. I personally heard some of these myself. Mr. Brownlie hopes to still further improve the long distance receptions and points out that as broadcasting in India has now been started, propaganda and education of the masses can be carried out at a comparatively small cost on a scale which would be prohibitive on account of costs by the old methods. I personally think that the time is not far distant when telephony will play an important part in agricultural education in the Punjab.

QUESTION 8.—IRRIGATION.—(a) (i) The Irrigation Department will doubtlessly supply the information.

(ii) This is being tackled by the Rural Sanitary Board, the Secretary of which can give all information.

(iii) I give below a history of the work done by the Agricultural Department.

Following the recommendations made by the Indian Irrigation Commission of 1901-03 on the subject of sub-artesian wells and trial borings a temporary staff of three well supervisors, twenty well borers and twenty mates, with twenty sets of hand well-boring plants, already referred to on page 17, were engaged as an experiment, for a period of four years in April, 1910. This staff worked under the Deputy Director of Agriculture, Gurdaspur, who was also in charge of the district work of the whole Province. A borer was in charge of each plant, and was assisted by a mate. The plants were used for the augmentation of water supplies in existing wells and for trial bores. The zamindar whose well was being bored provided the labour to work the boring plant, and paid a small footage allowance to the borer in charge of the boring. He also paid the actual cost of the metal pipes left in the well, on the completion of the boring. Government paid the wages, etc., of the borer and mate. In the case of an unsuccessful well the metal pipes were removed.

In 1915, when the Agricultural Engineer was appointed, the well boring work was put under his charge. Since then many alterations have been made in the methods of boring and in appliances used for that purpose; only a few of these can be mentioned in this note. Prior to the engagement of Mr. Brownlie as Agricultural Engineer in the department in 1915 he was engaged on Municipal Engineering work in Amritsar. During this period, and while extending the water supply of that city, he invented a form of strainer tube for tube wells which could be manufactured in India at no great cost. It proved to be as efficient as any of the more expensive varieties then on the American market. This strainer was found useful in the work of augmenting the water supply in ordinary wells in the Punjab. Before the introduction of these strainers many bores were unsuccessful because of the collapsing of the walls of the bore. This occurred when the thickness of the impervious stratum above the one from which the water was drawn, was insufficient to bridge over the cavity formed by the drawing off of sand in the well water, which occurred in such bores.

The introduction of strainers which form a porous casing for the bore enabled farmers to obtain a water supply from the sub-soil independently

of an impervious stratum, and consequently enormously increased the numbe of boring successes. In 1916 the well boring staff was made permanent.

In 1917 a light power boring plant was purchased but was not satisfactory.

In 1918 a heavier power boring plant was got from Australia at a cost of Rs.7,000 approximately. Trials showed that it was quite unsuitable for India, however, and that the life of such a plant would not exceed twelve to fifteen months. About this time the Agricultural Engineer designed a power boring plant which proved far more efficient and lasting while costing only Rs.5,000. It was also more handy to move from place to place than the power boring plants on the market. The department obtained three of these improved power boring plants as early as possible.

In 1922 the department was suffering from financial stringency and the Director of Agriculture suggested that the boring work should be put on a self-paying basis. After consideration, Government agreed to levy an overhead charge of Rs.50 per successful well, in order to cover part of the cost of the well boring establishment, depreciation of boring plants, interest on capital, etc.

A successful well was defined as one which shows an increase of water supply of not less than 20 per cent. over the recuperation test which is made prior to the boring.

The footage allowance was also fixed at the following rates:—

1¼ annas per foot up to 50 feet.
1¾ annas per foot for depths between 50 and 100 feet.
2¼ annas per foot for depths exceeding 100 feet.

As years passed on, the twenty original hand boring plants became worn out, and in 1924 they were replaced by a new and improved hand boring plant invented by Mr. Brownlie. This improved boring plant costs about Rs.2,000, while the old fashioned plant cost Rs.3,000. Besides its low cost the improved hand boring plant confers a great boon on farmers, as it requires only six to eight labourers to work it, boring the same depth per day as the old fashioned plant did with 12 to 15 labourers. The diameters of the bores are also considerably larger, being now 5 to 7 inches instead of about 2½ inches as they were commonly with the old machines; consequently the new bores yield considerably more water. Further, the new plant bores faster than the old one in unfavourable strata.

During the past few years the Agricultural Engineer has devised a strainer considerably cheaper than the original form of strainer designed by him and equally efficient.

Up to 1924 when the new plants were introduced the department has augmented the supply in over 4,000 wells, of which 80 per cent. have proved successful, and in their tests gave supplies of water increased by 20 per cent. to 300 per cent.

In order to meet the increasing demand from districts for ordinary well boring work, i.e., for the augmentation of water supplies in existing wells, a further staff of 1 Sub-Divisional Officer, 2 Well Supervisors, 40 well-borers and 40 mates, with 40 new sets of improved hand boring plants were sanctioned in 1925, when the financial condition of the Province began to improve. With a further addition of one Sub-Divisional Officer, 12 borers and 12 mates from April, 1926, the sanctioned well boring staff and equipment was, therefore, as follows:—

2 Sub-Divisional Officers, Boring,
6 Well Supervisors,
3 Mechanic Borers,
72 Well Borers, and
72 Mates,

with 72 improved hand boring plants, three improved power boring and one rock boring plant.

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It is of great importance to the Province that the supply of water in ordinary wells be increased, and nearly all districts are asking for help in this direction.

A description of what is contemplated is given in the five years' programme.*

It will be seen that in the next five years it is proposed to work up to 140 hand-boring sets, 10 power-boring, and two rock-boring plants. It is also proposed to divide the Province into four well-boring circles and to have one Sub-Divisional Officer in each—the whole work to be in executive charge of an officer of the status of an Executive Engineer under the direction of the Agricultural Engineer. With the above plant and staff it is expected that nearly 2,000 borings will be made per annum.

As regards water lifts, Persian wheels are the most important. Iron types of these were rare in the Province twenty years ago. Little progress seems to have been made in the introduction of iron types of wheel till within the last few years, but they are now common in villages all over the Punjab, and they are made locally.

As regards the work done on water lifts at the Agricultural Institute at Lyallpur, the Agricultural Engineer has devised several types of Persian wheels; and although finality has not been reached, considerable improvements have been achieved when compared with the wooden Persian wheel. A cheap form of metal roller bearing has been introduced, which reduces friction considerably and permits simple automatic lubrication of the moving parts. A modification of the *Charsa* or leather bag water lift has been devised, which eliminates the necessity of a man to empty the bag at the well head. The form, as it stands at present, is too expensive to become popular, and requires simplification. Surface tension water lifts have been tested, and various methods of applying compressed air are under investigation.

Progress has been slow, as there has been no trained assistant who could be constantly employed on the work to help the Agricultural Engineer, but sanction has recently been obtained for the employment of an Assistant Engineer for this work alone. There are many lines of investigation to be taken up.

As regards tube wells, the first of these were put down in the Punjab some fifteen years ago. The water extracted from one tube well may irrigate up to 350 acres as compared with an ordinary well which is capable of irrigating some ten to fifteen acres only. The initial cost of a tube well installation, however, is high, and landowners are somewhat reluctant to invest the necessary capital, although the Agricultural Engineer reckons that irrigation by such means is from 10 to 15 per cent. cheaper than by bullock power lift from ordinary wells. In this calculation he estimates the maintenance of a pair of bullocks at about Rs.28 per mensem, and considers that there are many districts in which this figure is exceeded.

As the improved boring machines and strainers already mentioned under ordinary well boring are all used in the installation of tube wells, a good deal of work has already been done to facilitate this work.

If a battery of several tube wells is worked from one central power station the irrigation costs are materially reduced, and in addition to this there is a duplicate plant, which greatly reduces the liability of loss of crop on account of the failure of the water supply at a critical time. The five years' programme of agricultural development contemplates the putting down of a battery of tube wells as a trial; and it is possible that it may lead to the development of this system of irrigation in areas liable to become water-logged through flow irrigation from canals.

In the Punjab there is a great field for this system of irrigation in areas uncommanded by flow irrigation and where subsoil water level is reasonably

* Not printed.

close to the ground surface. The Agricultural Engineer has pointed out that in the case of boring work connected with the augmentation of the water supply in ordinary wells only a portion of the cost of establishment, depreciation of boring plants, etc., is borne by the well owner, and he recommends that the question of subsidising tube well installations to some extent, and of maintaining and supervising these by Government, is well worthy of consideration.

Numerous applications are received every year from landowners in the Province who desire advice with regard to various kind of lift irrigation. Frequently the work involved is heavy, as estimates of capital cost, recurring cost, etc., etc., have to be calculated; also there are many instances where an estimate even of an approximate nature cannot be provided without first making a survey of land, and such cases usually have to be abandoned owing to want of staff.

Sanction has just been accorded for the entertainment, for a period of one year, in the first instance, of one Executive Engineer and one Assistant Engineer with the necessary staff to work up details of lift irrigation projects.

(*b*) The Irrigation Department in this Province has to deal with the biggest irrigation system in the world, and the department is amazingly efficient.

Turns of water are given in *pahars* of three hours each, and these turns come round to a farmer about once a week on the Upper Bari Doab Canal and the Sirhind Canal; they come round once in twelve days on the Upper Jhelum Canal, Lower Jhelum Canal, Upper Chenab Canal, Lower Chenab Canal, and Lower Bari Doab Canal. The turns of water are fixed by the canal authorities in consultation with the villagers, and the headman of the village sees that each farmer gets his turn. The only complaints that come to me are regarding canal closures which are sometimes considered too long or untimely, also occasionally regarding shortage of running supplies. Complaints to me are remarkably few however.

There is a call from some quarters for closer collaboration between the cultivators and canal authorities regarding closures and running supplies. Every Executive Engineer has an Advisory Committee composed of prominent zamindars in his division, but I think it would be more satisfactory to the public if Sub-Divisional Officers also had similar Advisory Committees to consult with on these matters.

The Agricultural Department is advocating the conservation of moisture in soils by better tillage and keeping the soil surface loose by harrowing, inter-cultivation of crops, etc. The canal authorities are lining parts of their canals to prevent waste by seepage.

The standing wave outlet seems to be most popular for distribution of water. One of its advantages is that when canal supplies are low, every outlet from head to tail of the channel gets a less discharge, whereas in the case of such outlets as the Gibbs Module a fixed discharge is given which within limits is independent of the head of water in the canal, and consequently when supplies are short there may be no water left to cultivators at the tail.

The irrigation water is paid for on the basis of acreage of irrigated crop grown, but I think it will be more economically used if paid for by volume. The volumetric system is being experimented with.

QUESTION 9.—SOILS.—*Prefatory remarks.*—In the Chemical Section of the department a large amount of analytic work on soils, manure, etc., is done annually. Systematic investigations have been started in order to determine the extent to which soils are being depleted of the various plant food materials.

The study of the micro-organic population (protozoa bacteria, algæ and other closely related organisms) of the local soils has been started in order to throw light on their seasonal variations and relationships to growing

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crops. The researches of the present and previous Agricultural Chemists have brought to light remarkable fluctuations in the Punjab, in the activity of bacteria concerned in nitrogen fixation. The object of these researches is to throw light on methods of adding to the stores of nitrogen in the soil, and the possibility of bringing nitrogen fixation under control. The subject is of great interest to farmers. The work done has been written up for publication as a memoir of the Department of Agriculture in India.

It may be mentioned here that from the surprisingly great intensity of the cropping which can be carried on in the Punjab without the addition of manures to the soil, and with surprisingly little tillage, it is obvious that the soils recover their fertility by natural means much more rapidly than soils do in Britain for example.

What is wanted is that science be brought to bear on natural agencies at work so that they may be understood and controlled as far as possible to the advantage of the farming community. This of course means work, properly qualified staff, and other facilities to do it with.

We have hardly touched the multitude of agricultural problems in this province involving chemical and bacteriological research which in the interest of farmers should be attacked as early as possible. More staff is urgently needed to cope with the greatly increased volume of work now flowing in on this section. Problems of green manuring, artificial manures of various kinds applied to crops, the manurial ingredients removed from soils by different crops, the systematic survey of the soils of the province, are but a few of these.

In the arid climate of the Punjab plains the conservation of moistures is an important question. Work has been started on the moisture contents of *barani* (rainfall) soils after preparatory tillage for wheats with different combinations of implements, but there is a vast field yet to be explored as regards movements of water in soil, water requirements of the different crops, water-logging in some areas, etc., etc.

A Bacteriologist and a second Agricultural Chemist have just been added to the cadre, and it is hoped to have a Soil Physicist during the next few years. The urgent need for a Soil Physicist section has been explained in the five years' programme and an outline of work that awaits to be done is also given therein.

Question 9.—*Soils.*—(*a*) (i) Soils in the Punjab are extremely deficient in humus but seem to be well supplied with essential mineral constituents such as lime, phosphates and potash. The reason of the deficiency in humus is that the soil temperatures and compositions are so favourable to bacterial action that plant *débris* is decomposed to its component salts in a remarkably short time. For example, *sann* hemp (*Crotolaria juncea*) seven or eight feet high ploughed, or rather trampled into the soil, will under the combined action of white ants and organisms of decay disappear from casual observation in about two months' time while the same amount of organic matter in Britain would not reach the same stage of decomposition in six months' time, or probably very much longer.

In this connection I append below a statement of soil temperatures taken at Lyallpur, at two inches, and one foot depth, in the months of June and December which are respectively the hottest and coldest months in the Punjab plains.

The temperatures were kept by the Cotton Research Botanist for purposes of his own work on cotton plants, but I give them here in connection with the point which I have mentioned.

For June 1926—

At 2 inches depth ...	Mean maximum temperature ...	... 40·5° C.
	Mean minimum temperature ...	... 26·0° C.
	Approximate daily average temperature	... 33·3° C.
	Approximate average diurnal range	... 14·4° C.
At 1 ft. depth ...	Mean maximum temperature ...	... 33·3° C.
	Mean minimum temperature ...	... 30·8° C.
	Approximate daily average temperature	... 32·1° C.
	Approximate average diurnal range	... 2·5° C.

For December 1926—

At 2 inches depth ...	Mean Maximum temperature ...	... 18·8° C.
	Mean minimum temperature ...	... 5·9° C
	Approximate daily average temperature	... 12·3° C
	Approximate average diurnal range	... 12·9° C.
At 1 ft. depth ...	Mean maximum temperature ...	... 13·0° C.
	Mean minimum temperature ...	... 11·8° C.
	Approximate daily average temperature	... 12·4° C.
	Approximate average diurnal range	... 1·2° C.

I have worked out the following figures for soils in Britain from those given by Keen and Russell in their article on "Factors determining soil Temperatures" (*vide* Journal of Agricultural Science, Volume XI, 1921, page 238) *viz.*—

Average maximum and minimum soil temperatures at six inches depth at Rothamsted.

	June 1914.	*December* 1914.
Maximum Temperature	20·4° C.	4·4° C.
Minimum Temperature	15·9° C.	3·4° C.
Range	4·5° C.	1·0° C.

Workers have shown that nitrifying organisms are most active near the surface of the soil at a temperature of 36 to 37° C.; that they cease again at temperatures under 5° C. or over 55° C.; and are seldom met with in soils in Britain at 18 inches depth.

The soils of the Punjab plains are alluvial and contain an ample supply of calcium carbonate which is one of the most suitable bases for the work of the bacteria concerned. Therefore the conditions in these are ideal for the action of these organisms.

Green manuring always has a markedly beneficial effect on the crops in the Punjab plains and in spite of the rapid decomposition of organic matter, applications of green manuring have appeared to show beneficial effects for four or five years after their application. This is probably due to the invigorating effect which the organic matter gives to nitrifying organisms.

Little time has been devoted to the study of nitrification of soils in the Punjab owing to want of staff, but some work has been done by Messrs. Barnes and Wilsdon who successively held the post of Agricultural Chemist to Government, Punjab, and by Dr. Lander the present Agricultural Chemist. From their work it will appear that large quantities of nitrogen are fixed in the soils in the months of August, September and October and that heavy losses of nitrogen take place later. Just what is the cause of this is not yet understood. If moisture is a factor, that can be controlled in irrigated areas.

As aeration and moisture content of the soil are important controlling factors in the stimulation of nitrification, it seems to me that investigations

into this subject might show the Punjab farmer when it will pay him best to irrigate and cultivate his lands.

Another point which seems to me of importance is the great diurnal range of temperatures which the soils of the Punjab plains are subjected to, and which must have a strong expanding and contracting effect on the soil particles tending to weather them. This I think has also much to do with the rapidity with which Punjab soils recover their fertility after a fallow, especially where the land is well cultivated during that time. Another factor is that the more arid climate allows less washing of nitrates etc. beyond the reach of the roots of crops.

The points above mentioned seem to shed a light on why crop after crop can be got without manures from soils in the Punjab at the astonishing rate at which they are got. In this connection I may mention that on the Gurdaspur experimental farm land which has been under wheat, year after year since 1912 with fallow in the summer, does not show any appreciable decrease in outturns of crop.

Again the light and heat of the sun is a wonderful power for plant growth which is given free to the Punjab farmers and which has to be paid for in the shape of tillage, manures, etc., by farmers in colder countries. In my opinion all the above-mentioned points will well repay intensive investigation as they have a great bearing on the questions of rotations, the economic application of tillage and manures to Punjab soils, etc., and indeed they seem to me to be of fundamental importance to the whole study of agriculture in the Punjab. Personally I feel that the Punjab with its fertile soils, its extensive resources for the supply of irrigation water, its astute and virile peasantry together with the extensive facilities for irrigation, communications, etc., which have been, and are being, placed at its disposal by Government will, if properly managed, place it in a position in which it can produce crops and put them in the world's market at a cost which most countries will have difficulty in competing with.

(ii) **The Ganji Bar Experimental Station** was founded to investigate the possibilities of reclaiming *bara* (hard) soils which exist in the province, and since December 1923 the work has been guided by an Advisory Committee consisting of—

(1) Director of Agriculture, Punjab.
(2) Mr. G. S. Henderson, Imperial Agriculturist, Pusa.
(3) Agricultural Chemist to Government, Punjab.

The Deputy Director of Agriculture, Montgomery, is in direct charge of the farm.

Experiments conducted there in the year under report have confirmed a number of past years' experiments. Rectangle No. 96 which was kept under 4 to 6 inches depth of water for about four months during the summer of 1924 was again kept under water for about five months in the summer of 1925, a total delta of 45 inches of water having been given to it in the latter year in order to maintain the above depth. The Agricultural Chemist reports that in spite of the application of this large quantity of water, no appreciable quantities of salt were washed down, and the soil layer immediately below the surface compared very unfavourably in moisture content with normal soils.

In the flooded areas several grasses appeared in May, and had covered most of the plots uniformly by the end of June. When the water was cut off on the 15th of August and the land was allowed to dry, these grasses had grown luxuriantly and cattle were allowed to graze in the area. Many of the grasses were coarse and were not eaten by the cattle. Those remaining after grazing were cut down, and an attempt was made to plough and put the area under crop. Such was the luxuriance of the growth however that the roots of the coarse grass rendered the preparation of a seed-bed impossible, so no crop could be sown in the area during last *rabi*. A crop has been sown, however, in the present *kharif*.

The characteristic of these *bara* soils in their natural unreclaimed state is that not a sign of any vegetation is seen upon them and to my mind the tremendous crop of wild grasses which came up on this square is the most hopeful sign we have yet seen of reclaiming these lands, as the roots of the plants must have penetrated well into the hard sub-soil and paved the way for its oxidation. The grasses are being identified.

Good results have also been got from the application of sand to the surface of *bara* lands, and from the application to them of gypsum.

In experiments with ordinary cultivation by bullock power versus deep cultivation by steam tackle, the results were in favour of deep cultivation as in past years.

An experiment has been started to see whether tree planting could be used as a means of reclaiming these lands. Among the numerous varieties of trees which have been planted *Kikar* (*Acacia arabica*) and *Shisham* (*Dalbergia sisso*) are the most successful. *Darekh* (*Melia Azedarach*), *Siris* (*Albissia lebbeck*) and *Farash* (*Tamarix orientalis*) have all failed. The outturns of the common crops on the farms, such as rice, wheat, sugarcane and senji are steadily improving and this is an encouraging sign.

Useful research has been done on the bacteriology of *bara* soils, and the data obtained show that since the *bara* soil at the Ganji Bar Experimental Station, Montgomery, was brought under cultivation, it has improved greatly.

In addition to this about 2,000 acres of *bara* land were set aside by Government in 1918 to be leased out to cultivators on easy conditions. This has all been taken up by small cultivators in holdings of ½ rectangle (12½ acres) to 2 rectangles. The main inducement offered was 10 acres of good land with each rectangle (25 acres) of *bara* land for the growth of fodder for cattle employed on cultivating the *bara* land. Other concessions given were remissions of water rates, land revenue and other dues for a number of years.

If the tenants display reasonable energy, and assiduity in the cultivation of the *bara* land, they get occupancy rights in five years from the date of the commencement of the tenancy, and proprietary rights five years later at a price not exceeding Rs.100 per acre and not less than Rs.5 per acre. This concession does not extend to the good land which was given at the rate of 10 acres per rectangle of *bara* land at the time of entry of the tenancy.

A grant of about 2,524 acres of inferior land in Montgomery district has also been made to a capitalist with a view to reclaiming it. If reclamation is carried out to the satisfaction of Government, this capitalist will be allowed to purchase these lands at the price at which they were valued when he took them over.

A considerable improvement has been effected in many of the *bara* holdings above-mentioned. The method of reclamation employed by tenants has been the spreading of sand on the surface of the *bara* soil; green manuring, heavy watering and good cultivation.

(iii) In cases of erosion of the surface of soil by rain water, making of bunds, planting of trees, terracing, etc., would be useful. To get extensive results collaboration of farmers or the help of Government may be necessary.

(*b*)—(i) The case of the *bara* land mentioned above.

(ii) Yes, water-logging has taken place along the sides of some of the Punjab canals, for example in Hafizabad tahsil in the Gujranwala district, in Sialkot and in Sheikhupura districts. The Irrigation Department are taking steps to cope with this by means of drainage, lining canals, etc.

QUESTION 10.—FERTILISERS.—(*a*) Yes, the department is advocating the proper conservation in manure pits of cattle dung, village sweepings, refuse of crops and all matters which may be of manurial value. In most villages much of these is wasted.

Experiments made by the Agricultural Department have shown that green manures give very good results, and this is being advocated. In canal irrigated areas, Government charges no irrigation water rates for crops ploughed in as green manure.

Trials with artificial manures have not been very encouraging. Experiments so far carried out at our farms with artificial manures show that while most of these give enhanced outturns, they do not repay expenses. This is the case especially with applications of phosphates and potash. There seems to be little or no deficiency of these ingredients in an available form in the soils under the present general system of cropping. Nitrogenous manures have been more promising, but much more investigation is needed. The use of castor and other cakes as manures also requires further investigation.

(*b*) The practicability of introducing legislation on the lines of the Fertilisers and Food Stuffs Act of 1906 (Laws of England) should be explored.

(*c*) These should be tried in properly laid out plots on our experimental farms. They should then be similarly tested on demonstration farms and on farmers' own lands. If necessary the question of reduction of railway freights might be considered.

(*d*) The following statement gives the amounts of nitrate of soda sold in the Punjab during the years 1925 and 1926:—

——	Kharif 1925.	Rabi 1925.	Kharif 1926.	Rabi 1926.
	Maunds.	Maunds.	Maunds.	Maunds.
Lyallpur District ...	137	118	220	180
Sheikhupura District ...	73	75	133	67
Jhang District	—	33	7	3
Multan District	85	49	1,106	94
Montgomery District ...	64	68	195	160
Lahore District	22	16	75	67
Amritsar District ...	25	32	86	66
Jullundur District ...	48	30	102	95
Hoshiarpur District ...	15	—	72	40
Gujranwala District ...	18	14	105	83
Gujrat District	14	20	97	87
Ferozepore District ...	—	20	51	39
Hissar District	—	—	68	39
Sialkot District	—	—	85	72
Muzaffargarh District ...	—	—	2	17
Shahpur District ...	—	—	77	69
Total	501	475	2,481	1,178
	976		3,659	

NOTE.—1 maund = 40 seers = 82⅔ lbs.

It will be seen that the total amount of nitrate of soda used in the year 1925 was 976 maunds, and that in 1926 it was 3,659 maunds. The manure was applied chiefly to cotton and wheat crops. Cotton getting 1¼ to 1½ maunds per acre and wheats about 1 maund per acre.

(*e*) More investigation is required.

(*f*) A supply of a cheap fuel is required for this purpose. In this connection more trees might be planted on the extensive waste areas along the banks of canals and elsewhere. A point, however, is that cow dung

produces a slow fire and a very even heat which is hard to beat by other fuels available.

I also feel that the waste, which occurs by burning of cow dung, is not as great as is generally supposed. The only loss that takes place by burning is that of organic matter and nitrogen, and obviously the climate, soil and other conditions in the Punjab provide amazingly good facilities for the recovery of these losses and for the general recovery of soil fertility (*vide* reply to Question 9 (*a*)). Coupled with this we have the fact that applications of nitrogen, phosphates, potash and lime to Punjab soils do not have the outstanding effects that most people might expect.

The question before the farmer is whether, in the conditions in which he finds himself, it will pay him best to burn the cow dung and lose the benefit of applying it to the crop, or apply it to the crop and buy his fuel.

The subject seems to me to require much further investigation than it has yet received.

QUESTION 11.—CROPS.—(*a*) (i) I am convinced that very great improvements can be made on existing crops. Certain work has been done in this connection in the Punjab, on cottons, wheats, barleys, grams, dates, potatoes, &c., but practically nothing has yet been done on such important crops: *bajra*, *jowar*, rice maize, oilseeds, fodder, &c.

My opinion is that the Economic Botanist who sets out to improve these crops must look at them strictly from the farmer's point of view, and keep in mind the fact that increased profit per acre is the only thing that will make a farmer grow one variety instead of another. When starting the work, the Botanist must discover the factors, both agricultural and commercial, which go to make up profit per acre and study these carefully. In the case of cottons for example, outturn per acre, disease resistance, suitability to the climatic conditions, methods of cultivation, &c., are points of agricultural importance, while the question of the value of differences in length of lint, its fineness, strength, &c., in the available markets are very important commercial qualities.

Again the Botanist must have land, and facilities to grow these under his personal supervision, not only on tiny plots, but on a field scale, as what is wanted is a crop that will give improved results to farmers, and the detailed scientific supervision of a specialist working on a particular crop cannot be got at second hand even from one's closest friends. This may be because these friends have not had the facilities to make the close study of the work of a particular crop that the Economic Botanist has had, but even if equal facilities for study were given to both men the chances are that they will not interpret in the same way the effects of factors acting on the crop, and will come to different conclusions.

In beginning cotton work in a locality the first thing to do is to collect samples of every type of cotton grown there, and from other localities which promise a chance of providing types which will be of value. The types should then be separated and grown as pure cultures and tested for their relative monetary returns per acre. Usually many types can be eliminated almost straightway: the remainder must be more severely tested. Simultaneously every important factor which goes to influence monetary return must be taken up and investigated in order of its relative importance. This order is essential as one meets with so many interesting problems in these investigations that there is a great temptation to take up investigations which in the interests of agricultural development ought to be left to a later stage.

One of the most difficult problems which the Botanist attempting to improve a crop has to face is to prove that one type yields more produce than another in average seasons. To help me in this difficulty I started the system of testing my types in long narrow plots interstripped with a standard variety at suitable intervals. These plots can be seen at Lyallpur.

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From my experience of farming it seemed to me important to have an assistant who would devote his whole time to the supervision of the agricultural operations on these plots, and who would report to me anything which seemed to affect the growth of the plant, or the outturn of the produce in any way. I, therefore, posted one assistant to this work as soon as possible. As expected he soon gained a great deal of knowledge and experience about that phase of the work and we were able to diagnose cases of variations in results which otherwise would have misled us entirely as to which types really promised to be of most value to farmers in this province.

Very soon we found so many problems waiting to be attacked that the full attention of a specialist and staff were required for this crop alone, and the results which came to hand showed that the employment of such a staff would repay the province very handsomely.

Wheats were taken up on similar lines and included a study of their milling and baking properties as well as their agricultural characters.

(ii) In my opinion the first and most important thing to do as regards fodders is to study the different types of fodder plants now growing in the province. Much may be done by selecting and multiplying the best of these. Fodder crops from outside the province are less likely to be suitable until acclimatised. One sometimes comes across something of value in other countries however. Among fodders, for example, berseem from Egypt is promising, also Scotch oats, French oats, Japan rape, &c.

As regards other crops we have the case of 4-F American cotton which was probably acclimatised in India for half a century or more. Freshly imported cotton seeds from America, Egypt, and the Sudan have all been repeatedly tried and found failures.

On the other hand we have the cases of Scotch potatoes, Arabian date trees, and other fruits from many parts of the world which have been very successful straight away.

(iii) The work of seed selection and distribution of *deshi* cottons dates back to 1904, a couple of years before the formation of a separate Department of Agriculture. In those early days there was no district agricultural staff and this work was done under the guidance and persuasion of district officers. The seeds of indigenous varieties of cotton were collected from selected pickings of varieties grown in such well-known cotton-growing districts as Hissar, Gurgaon, Lahore, Dera Ghazi Khan and Lyallpur. The results were disappointing, however, and these cotton-seed operations were closed down in 1908, as it was found that the selected seed was no better than the seed which farmers themselves kept for future sowings. At the same time acclimatised Dharwar American cotton-seeds were being brought from Dharwar annually and were distributed to farmers. These seeds also were not successful.

Wheat seed distribution began in 1905, when 360 maunds (1 maund = 82⅔ lbs.) of grain grown on the Lyallpur farm were distributed to farmers, 500 maunds of Australian wheat were also imported by the Department that year. Neither of these lots did any good.

The distribution of seeds which have proved themselves of value began in 1912-13, when 45 maunds of indigenous cotton-seeds, 83 maunds of 4-F American cotton-seeds, and 227 maunds of Punjab-11 wheat from the Agricultural Institute, Lyallpur, were sold to zamindars. Since then the work of seed multiplication and distribution has progressed very rapidly.

The usual procedure adopted in getting out to farmers promising types of crops from the Botanical Section is as follows:—

If the crops are found promising in that Section after a severe series of tests under expert supervision, they are then tested on the experimental farms. If found successful there, they are further tested on the demonstration farms in likely localities, and if again found successful they are finally

tried on demonstration plots on farmers' own lands. The general method of testing a new type is that it is grown under as equal conditions of soil, cultivation, etc., as possible, in a number of long, narrow plots interstripped with the local variety which it is intended to displace. Under these conditions it is carefully compared with the local variety as regards yield and other agricultural and economic characteristics. The definition of an improved crop that it shall give a greater profit per acre on farmers' lands than those already grown there.

Seeds of types which have stood these tests successfully are multiplied on the departmental seed farms, grantee farms and the lands of selected private farmers. Improved seeds grown on grantee farms, and lands of private farmers are purchased by the Department at harvest time and stored in the department's own godowns, or with agents at convenient centres, under the supervision of the department. The price paid to farmers for these seeds is usually about a couple of annas per maund over market price, in order to compensate growers for any extra trouble involved in keeping the seeds pure and in growing them satisfactorily. The seed agencies are offered to co-operative societies where they are prepared to take up the work, but on the whole they do not work as satisfactorily as private agents, who are business men, have self-interest at stake and know that they can be dealt with summarily in case of unsatisfactory work. The seeds are usually sold to zamindars at a premium of about 4 annas a maund or more over market rates. This premium covers any extra cost of the seed, freight to the store, wear and tear of bags, handling, etc., and most important of all it prevents these improved seeds being bought up by people for food purposes. In years when prices are lower at sowing time than at harvest, Government loses money, but when the prices at sowing time are higher than at harvest, as is often the case, Government makes a profit. On the whole, Government usually makes a profit over its seed transactions *vide* statement below:—

Statement showing profit and loss of cotton-seed transactions from 1918-19 *to* 1924-25.

Year.	Quantity of seed purchased.	Purchase money including incidental charges and outstanding.	Sale money and recoveries from last year's transactions.	Profit or loss.	Remarks
	Mds.	Rs.	Rs.	Rs.	
1918-19 ...	51,190	43,671*	7,129	—	*Complete figures not available.
1919-20 ...	35,259	2,27,589	3,61,778	+1,34,189	Profit.
1920-21 ...	50,369	2,95,674	2,95,487	—187	Loss.
1921-22 ...	38,655	2,31,089	2,22,443	—8,646	Loss.
1922-23 ...	17,319	1,56,383	1,69,058	+12,675	Profit.
1923-24 ...	32,915	2 48,478	2,55,593	+7,115	Profit.
1924-25 ...	35,757	3,26,530	3,50,908	+24,378	Profit.
Total ...	—	—	—	+1,69,524	Profit.

NOTE.—Value of stock (seed and bags) including outstanding balance in hand on 1st April each year has been added to purchase money. Similarly value of stock in hand on 1st March each year has been added to sale money.

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Statement showing profit and loss of wheat-seed transactions from 1918-19 *to* 1924-25.

Year.	Quantity of seed purchased.	Purchase money including incidental charges and outstandings.	Sale money and recoveries from last year's transactions.	Profit or loss.	Remarks.
	Mds.	Rs.	Rs.	Rs.	Rs.
1918-19... ...	31,380	1,25,340	1,81,479	+56,139	Profit.
1919-20... ...	13,249	79,637	79,574	—63	Loss.
1920-21... ...	19,624	1,20,315	1,25,543	+5,228	Profit.
1921-22... ...	17,738	1,49,628	1,90,994	+41,366	Profit.
1922-23... ...	25,694	1,87,624	1,51,772	—35,852	Loss.
1923-24... ...	14,716	1,21,614	1,18,240	—3,374	Loss.
1924-25... ...	18,334	1,17,293	1,27,493	+10,200	Profit.
Total ...	...	...	...	+73,644	Profit.

NOTE.—Value of stock (seed and bags) including outstanding balance in hand on 1st April each year has been added to purchase money. Similarly value of stock in hand on 31st March each year has been added to sale money.

The important point, however, is not the direct cash profit or loss to Government on these transactions but the increased prosperity which the improved seeds bring to cultivators. In this connection it must be remembered that the supply of good seed not only gives an increased outturn per acre, but the replacement of the original mixtures by pure types on large areas enables the farmers to get more money for their produce, as full market value for the produce cannot be given by traders until consignments of some magnitude are forthcoming.

In the year ending 30th June, 1926, some 30,000 maunds of wheat seed, and 33,000 maunds of cotton seed were purchased by the Department and sold to zamindars.

The purchase of good seed is a method of improving crops easy for the zamindars, and it is expected that, with a larger staff in the department and the new farms proposed in the five years' scheme of development, much more can be done in this important line of work.

The lack of seed merchants in India necessitates Government taking a large hand in supplying farmers with good seed, and the Punjab Government has always been generous in providing the Agricultural Department with money for its seed transactions. It is hoped, however, that in time farmers will be persuaded to adopt a system of keeping seeds of improved varieties from their own plots, and also that private seed merchants will appear.

(iv) The animals which do damage in the Punjab may be classified as:—
(*a*) large animals—including pigs, deer, *nilgai*, jackals, etc.:
(*b*) smaller animals—including rats, hares, porcupines, etc.:
(*c*) birds.

For large animals organised combinations of farmers to undertake hunting expeditions would be useful. With the clearing of jungles and the opening of communications the lives of these animals are becoming more precarious.

Regarding the smaller animals, the Agricultural Department has undertaken extensive rat-killing operations and has now a staff of two Agricultural Assistants, with four temporary *mukaddams* and eight field men engaged on this work. Applications for anti-rat operations were received from 27 out of the 29 districts of the Province last year, and extensive organised campaigns were undertaken on an area covering over 347,000 acres. This staff, however, did not nearly cover the area from which the complaints were received. Gram seed and gur mixed with strychnine hydrochloride were used as baits. Some 721 ounces of strychnine hydrochloride were consumed, costing about three pies per acre. The total number of rats killed was estimated at over 7 millions. Fumigation with calcium cyanide was used against mole rats in 43 operations, covering an area of 1,213 acres. Eleven thousand, four hundred and twenty rat burrows were treated, and 323 lbs. of raticide were used. The average cost of the poison per acre worked out at 3·3 pies.

Reports of serious damage from porcupines were received from Gurgaon and Ludhiana districts and 64 operations were carried out; 549 burrows were treated and over 1,000 porcupines were reported to be killed. The average quantity of calcium cyanide used per burrow amounted to 7·3 ozs. and cost annas 3·8.

Some work was done to discover the food of birds by shooting them and examining the contents of their stomachs. Little has yet been done on this as more pressing problems await us.

(*b*) No. We are trying to increase the yields of the crops already grown.

(*c*) As will be seen from the history of the department on page 13, the staff available for work on crops was very limited until recently, and consequently only a few of the more important crops could be taken up by the department. A brief account of some of the work done is given below:—

Cottons.—In 1907, no official or trader believed that it was possible to grow long staple cottons successfully in the Punjab. They pointed out that this had been tried many times in the past 100 years and that these efforts had consistently resulted in failures. Results from trials of Dharwar and other Americans up to 1908 caused the then Deputy Director of Agriculture, Lyallpur, to write "the true policy seems to be to avoid sudden expansions until the selection, crossings, etc., have produced some definite results. We are quite prepared to advance to a large area when a type more suitable to the country has been produced." 4-F was evolved in the Botanical Section and thoroughly tested there. It was also tested on the agricultural experimental farm at Lyallpur and was officially given out in 1913. By 1919 it was growing on half a million acres. The Department could not supply the seed fast enough to meet the demand, although higher prices than those of local seeds were charged. This rate of spread of a single type of cotton has no parallel, not even in America—so far as has been discovered. The reason why there was such a demand for it was simply because farmers were getting larger profits by growing it than by growing their unselected *deshi* cottons. In years of bollworm, untimely rains, hail etc., the difference in favour of 4-F was accentuated owing to its longer flowering season, etc. In 1919 the 4-F lint was trash on large areas; in 1920 the lint from a smaller proportion of the crop was trash, and in 1921 the crop of lint was again as bad as in 1919. This led many people to believe that these cottons had cross fertilised and had permanently deteriorated. But the good quality of lint got in 1922 and 1923 from seeds of the cottons which gave trash in 1921 has shown that this interpretation of the case is untenable. The cause of the poor quality of the American

fibre was given in the Economic Botanist's published reports on the causes of the cotton troubles in 1919 and 1921. Put very briefly, the cause was insufficient water for the needs of the plant during the flowering and fruit seasons. This was aggravated by hot winds and other climatic conditions, coupled with high prices of wheat and *toria*, which induced farmers to prepare a larger area of land for these crops in September, October and early November than previously, thus leaving a diminished supply of irrigation water for American cottons during the time they are flowering and developing their fibre. The trouble was, of course, most felt in the drier parts of the Province, and *deshi* cottons being more drought resistant than Americans, were less harmed. *Deshi* were also very seriously affected, however. During the investigations into the case it was observed that even in the worst affected areas there were plants yielding good American fibre where the crop had got plenty of water during the flowering and fruiting time and where sheltered from desiccating winds by wind breaks. Hot dry winds in summer are quite common in the Punjab and the provision of wind breaks for the cotton crop is a valuable safeguard. It is a simple matter to provide wind breaks of *arhar* (Cajanus indicus) or other more suitable crops in cotton fields. A most important fact, which has been demonstrated, is that good American lint can be grown in the Punjab in any year provided the crop receives proper attention.

285-F, another Lyallpur selection of American cotton, after searching tests in the Botanical Section, appears to be hardier, more drought resistant and a higher yielder, than 4-F. Also its lint is far superior to 4-F. A measure of this difference in quality of lint is shown by the fact that it spins 40*s*. to 50*s*., while 4-F spins 20*s*. to 25*s*. For the requirements of Punjab conditions, this cotton is a very great step in advance of 4-F, but it is not yet popular with farmers, as it requires treatment different from 4-F, and farmers are not yet accustomed to it.

289-F, a still later selection, is a heavier cropper than either 4-F or 285-F and has lint rather better than 285-F. It has done extremely well so far, wherever it has been grown, and is already in demand. Other improved varieties are now in the course of evolution.

Among *deshi* cottons, a number of greatly improved types have been evolved at Lyallpur, but in the canal colonies the demand for these has been small in the face of the more profitable American cottons available. On the poorer lands in the canal colonies, and where water is scarce in September, October and early November, *deshis* are more profitable than Americans. Consequently, it is economic to grow a certain area of *deshi* cottons in those colonies where such conditions prevail.

The greatest demand for improved *deshi* cottons is in the Hansi circle. A variety of *deshi roseum* cotton selected at Hansi from the local mixture is in great demand there, and seeds of it sufficient to sow about 21,000 acres were supplied to farmers by the Deputy Director of Agriculture in charge. The demand for these seeds was greater than the supply available.

In the *kharif* of 1924 we find the following area of cottons in the Province, excluding Native States:—

Irrigated.			Unirrigated.			Grand Total.
Deshi.	American.	Total	Deshi.	American.	Total.	
Acres. 1,096,910	Acres. 962,134	Acres. 2,059,044	Acres. 265,092	Acres. 2,199	Acres. 267,291	Acres. 2,326,335

The areas under improved cottons in *kharif* 1924 were as follows:—

Variety.	Date officially given out to farmers.	Area in acres.
4-F	1913	947,950
285-F	1921	14,300
289-F	—	2,070
Deshis (including Mollisoni, Neglectum and Sanguineum)	Various years.	67,400
Total	...	1,031,720

To give some idea of the comparative values to Punjab farmers of the principal types of cotton evolved by the department, the results got by several private farmers who grew these types on large areas, and for which data are available, are quoted below:—

Estate.	Type.	Area in acres.	Outturn of kapas per acre.	Price obtained per maund kapas.	Gross income per acre.	Remarks.
			M. S. G.	Rs. A. P.	Rs. A. P.	
Convillpur Estate.	285-F	400	8 33 0	17 0 0	...	Both cottons were sold in one lot but it was understood that 285-F was worth Re. 1 per maund more than 4-F.
	4-F	600	9 22 0			
Renala Estate.	285-F	1,251	9 2 0	...	...	Sale price of kapas not stated.
	4-F	169	10 0 0			
Coleyana Estate.	289-F	662	10 18 0	16 7 0	171 12 0	
	285-F	390	7 36 0	16 12 0	132 5 0	
	4-F	438	8 29 0	17 6 0	151 9 0	
British Cotton Growing Association Estate.	289-F	757	16 27 0	18 0 0	300 0 0	
	285-F	529	15 0 0	18 0 0	270 0 0	
	4-F	592	13 31 0	17 0 0	234 0 0	
	Mollisoni.	525	12 5 0	16 0 0	194 0 0	

As already stated, the result of several years' trials in the Botanical Section at Lyallpur, where a special study is made of cotton, is that among the American types quoted, 289-F is the highest yielder, and that 285-F comes next and that 4-F is third. This is the order in which these cottons stand on the British Cotton Growing Association Farm, Khanewal, where also a special study of the different types of cottons and their needs is made. Further, 289-F tops the list as regards yields on the Coleyana Estate.

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285-F, which is a hardy cotton and an early ripener, does not stand in the expected position either at Convillpur, Renela or Coleyana. This is not easy to explain without much more data, but if this type was allowed to wilt and shed its fruits at the end of September, as happened in many cases in the year under report, it might easily make the difference, as 4-F is a later ripener. Again, this type requires a higher seed rate per acre than 4-F, and its seeds have to be well soaked before sowing, in order to get a good germination. Also it requires narrower spacing between the rows, and if for any of these or other reasons the stand of the cotton was not as good as that of 4-F, the differences in yield recorded above would be easily accounted for.

As regards prices obtained for the *kapas* of the different types, it will be seen that the British Cotton Growing Association got for 4-F only Rs.1 per maund premium over the *deshi* selection "Mollisoni," and Rs.1 per maund for 285-F and 289-F over 4-F; also that Coleyana actually got for 4-F annas 10 more per maund than for 285-F, and annas 15 more than for 289-F. In face of the valuations of the lints of these cottons made by spinners that year, and the fact that the premiums for Americans over *deshi* were Rs.2 to Rs.4, the explanation seems to be that these cottons were sold on different dates when prices had altered. In spite of this, however, the British Cotton Growing Association got Rs.40 per acre more for its 4-F; Rs.76 per acre more for its 285-F, and Rs.106 per acre more for its 289-F, than for its Mollisoni. We must also remember that the Mollisoni on the British Cotton Growing Association farm was a *selection*, and that it was probably giving two maunds more per acre as well as a premium of Rs.1 to Rs.2 per maund over ordinary *unselected deshi*, so that the extra profits per acre got by growing selected cottons on that farm were much higher than those above mentioned. The Deputy Director of Agriculture, Hansi, reckoned that farmers got an extra Rs.36 per acre by growing selected *bhatla* cotton instead of unselected *deshi*. He reckoned that the *kapas* fetched a premium of about Rs.2 over unselected *deshi*, but for the purpose of getting some notion of the value of our selected cottons to the Province let us take the following much more modest estimate:—

Kind of cotton.	Outturn of kapas per acre.	Rate per maund kapas.	Gross income per acre.	Extra gross income per acre over unselected Desi.
		Rs.	Rs.	Rs
Unselected *Deshis* ...	6	15	90	*Nil*
Selected *Deshis*	7	16	112	22
4-F American	7½	17	127	37
285-F and 289-F... ...	7½	18	135	45

Multiplying these extra gross incomes acre into the areas of improved cottons grown in the Province, we get the following figures:—

	Acres.	Rs.	Rs.
Selected *Deshis*	67,400	× 22	14,82,800
4-F	947,950	× 37	3,50,74,150
285-F and 289-F	16,370	× 45	7,36,650
Total			3,72,93,600

Or an extra profit of say 3¾ crores of rupees for the *kharif* crop of 1924.

These American cottons have entirely altered the standard of quality of cottons produced by the Punjab, and have raised the price of land in the Province. They have also put more money into the pockets of farmers in one year than has been spent on the Punjab Agricultural Department since it started. The work done has opened up a field of possibilities of improving the cotton crop, which has attracted the attention of the Indian Central Cotton Committee, and that Committee has agreed to spend:—

(*a*) a non-recurring sum of Rs.29,000 at Lyallpur chiefly on the building and the equipment of a Research Laboratory;

(*b*) a recurring sum of Rs.45,000 per annum for five years which will be spent chiefly on salaries and allowances of the Cotton Research Botanist and part of his establishment upkeep of apparatus, etc.

The Punjab Government provides the Cotton Botanist with 218 acres of land, together with implements, bullocks, field labour, etc., necessary to farm these lands, and part of the superior establishment required.

Wheats.—From masses of types of wheats collected or bred at Lyallpur a number of improved types have been isolated. These have been tested as regards their agricultural, their milling, and their baking qualities.

The work of wheat improvement is very important, as the area under the wheat crop in the Punjab is very large. The following are the figures of area under wheat (excluding Native States) for the season *rabi* 1924-25:—

Irrigated acres.	*Unirrigated acres.*	*Total acres.*
4,728,154	4,928,867	9,657,021

The areas under improved wheats in *rabi* 1924-25, including areas to which Agricultural Department seeds were supplied indirectly, is estimated as follows:—

Variety.	*Year officially given out to farmers.*	*Area in acres.*
Punjab-11	1913	889,920
8-A	1919	257,990
Other improved types	Various years.	2,140
	Total	1,150,050

It has been shown conclusively that Punjab-11 gives 1½ to 2 maunds of grain per acre more than the original local mixture, and that 8-A yields 1½ to 2 maunds per acre more than Punjab-11. Also Punjab-11 grain gets a premium over local mixed wheats, and 8-A gets a premium over Punjab-11. Again, 8-A yields more *bhusa* per acre than Punjab-11.

The extra 1½ maunds of grain per acre of Punjab-11 at Rs.4 per maund on 889,920 acres therefore gave an added income of Rs.53,39,520 to farmers, and taking three maunds per acre as the yield of 8-A over the original local mixture at a value of Rs.4 per maund on 257,990 acres the extra value to Punjab farmers from this wheat comes to Rs.30,95,880; this takes no account of premium on grain, the extra money for straw, etc.

For the 2,140 acres of other improved varieties we may take two maunds per acre as the extra yield over unselected wheats. This at Rs.4 would be Rs.17,120.

The total income from extra outturn from improved wheats, therefore, was not less than Rs.84 lakhs for the *rabi* crop of 1925. But this sum, large as it is, represents the extra profits from only about one-ninth part of the total area under wheats in the province.

As a result of investigations at Lyallpur earcockle (*Tylenchus scandens*) disease in wheat can be promptly cured at practically no expense to farmers. The disease has been found in some cases to destroy up to 75 per cent. of the crop in the field, and in a single district in one single year it was

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found to be causing damage to the value of over a lakh of rupees. Propaganda work for the extermination of this disease is being carried on as far as staff permits.

Sugarcane.—The position of this crop in the Province is peculiar. I give below a short explanation together with a few remarks of the work done.

Sugarcane grows best in humid, warm atmosphere, and it was admitted by the Indian Sugar Committee of 1920 that the Punjab is outside the world's cane-growing zone. Nevertheless over one-third million acres are grown in the Province, and the area is about 17 per cent. of the total area of sugarcane grown in India. Sugarcane, however, forms only about one per cent. of the total sown area of crops in the Province.

Ninety-eight per cent. of the canes grown are of the thin-stemmed varieties. Thin varieties of cane are preferred as they are more disease, drought and frost resistant, and therefore a safer crop than the thick variety. They can also be grown on poor lands, and are specially suitable for fodder, as just that proportion of the crop required for fodder can be fed to cattle, while the remainder can be turned into *gur* and used for family needs, or sold to meet liabilities.

In many *barani* (rainfall) districts 50 per cent. or more of the crop is used for fodder purposes in years of fodder scarcity. Thick canes are grown only around large villages and towns. They are mainly used for chewing purposes. Limiting factors in the spread of thick canes are, water supplies, manures, and fuel for boiling the cane juice, the short cane-growing season, and the frosts which occur in the Punjab. Even when manures are available their application to the crop tends to delay ripening and results in a poor quality of *gur*. For this reason the thick types of cane at present grown pay well only if sold for chewing purposes; if turned into *gur* they result in a loss to the grower.

According to investigations made by an officer of this department last year, sugarcanes are grown at a loss in many districts of the Punjab if labour, &c., is paid for at market rates, and there seems little doubt that under present conditions cane is unable to compete with such crops as cotton, wheat, *toria*, &c., grown in the canal colonies, and in many other parts of the Province.

There seem to be special reasons why Punjab farmers grow sugarcane. But, briefly, they appear to be as follows:—

(*a*) the cutting and crushing of the cane and the *gur* boiling are done at a time of year when there is very little work for men and beasts on the farm to do; therefore, the labour involved costs the farmer little or nothing extra, if he keeps his area of cane within limits manageable by the ordinary labour kept on his farm;

(*b*) on a Punjab farm *gur* is considered a necessity for household purposes;

(*c*) *gur* is a very useful addition to cattle food; indeed, in time of bad health among the stock, Punjab farmers regard it as essential for their animals; also the tops of canes and the chopped or unchopped stem provide nutritious fodder;

(*d*) the sale of *gur* provides the farmers with ready money to help them to pay their revenue and other liabilities at a convenient time of the year.

In the circumstances described under (*a*), (*b*) and (*c*) above, farmers prefer to grow what *gur* they require instead of having to buy it. Then, as already indicated, an additional reason for growing thin canes in localities not too secure as regards fodder supplies is that the crop is a very important insurance against fodder scarcity.

All the above seems to indicate that the bulk of the efforts to improve cane farming in the Punjab should be devoted to work connected with the thin types of cane. An important point in connection with attempts

to improve the sugarcane crop in this Province is that the canes do not ripen seeds and seldom come into flower. Therefore, crossing to improve the types can only be done elsewhere. This work is done for the Punjab by the sugarcane breeding station at Coimbatore, which is under the Government of India.

Other lines of work, which are open to the Punjab, consist of investigations into:—

(*a*) the possibility of improving the cultivation of cane by improved methods and implements;

(*b*) the relative agricultural values, *i.e.*, cropping power, chemical composition, &c., of all types of canes available for trial;

(*c*) improvement in cane-crushing machinery;

(*d*) improvements in *gur*-making, crude and refined sugar-making, &c.

The Gurdaspur Experimental Station, which was opened in 1910, is the main centre for sugarcane work in this Province. It started with about a hundred cane varieties, collected from different parts of India, and from other countries, and has continued with the introduction and testing of varieties likely to be suitable for the Province; including a large number which have been received from the Coimbatore Cane Breeding Station in recent years. It carries out manurial and cultural experiments connected with the crop, testing of cane-crushing mills, work on improvement of *gur*-boiling furnaces, &c. Since last year an Assistant to the Chemist, who works under the Agricultural Chemist, Lyallpur, has been stationed at Gurdaspur to carry out chemical analyses connected with the testing of the various varieties at different stages of their growth, &c. At the Lyallpur Experimental Farm similar work is done on a small scale. A certain amount of cane work is also done at the Hansi Experimental Station. On all these farms very much higher outturns of *gur* are got per acre than are got on ordinary farmers' lands. This is partly due to better cultivation and partly to improved varieties.

A large number of improved varieties of cane from various parts of India and other countries have been tried at one time or another on the Gurdaspur and other farms. Quite a number of years ago several of these were found to give better results than the local varieties, and were given out to farmers. More recently varieties bred at the Sugarcane Experimental Station, Coimbatore, have been under trial on our farms and have done very well. Indeed the increase in yields of some of them over those of local canes promises to be such as may materially alter the position of the sugarcane crop in the economy of Punjab farming. Sets of these promising canes are now being distributed to farmers. About 8,000 acres of farmers' lands are under these improved varieties, so farmers are beginning to benefit by them.

Gur boiling furnaces have also been markedly improved. In one of the improved types of furnace evolved at the Lyallpur Farm, 100 maunds of cane juice can be boiled down to *gur* with about 30 maunds of fuel (*megasse* and cane trash), while in the local furnace 100 maunds of cane juice requires 70 maunds of similar fuel to effect the same purpose. The time required to boil down the juice to *gur* is also shortened by about half. Improved furnaces evolved at Gurdaspur have shown a 35 per cent. saving in fuel, and 240 per cent. saving in time.

Investigations with a view to further improvements on these furnaces continue and a number of improved furnaces have been constructed for farmers in the central districts.

As regards sugar making, the Punjab Government has recently had Mr. Noel Deerr, a well-known sugar expert for a month, touring in the Punjab to investigate the possibilities of establishing modern sugar factories in place of the rudimentary uneconomic processes now in use in the Punjab. The case is under consideration.

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Ret rot (*Colletotrichum falcatum*) disease of sugarcane does much damage to the thick varieties in the central districts. Investigations in connection with this disease have been made for a number of years now, and striking results have been got; for example healthy Amritsari cane has been grown interstripped with diseased Ferozepore cane since 1919 and up-to-date the Amristsari cane has remained apparently free from the disease, while 76 per cent. of local canes in the control plots was affected by the disease in the past year. This throws an interesting light on the methods of spread of the disease and is a piece of information of practical value to farmers.

Other crops.—Grams and barleys have been tackled in a manner similar to that of other crops as far as staff has permitted and improved varieties of each have been sent out to farmers in recent years, but several and valuable leguminous crops grown have not been touched for want of staff, nor have we touched such important crops as *jowar*, *bajra*, rice, maize, oil-seeds, etc. The fodder question is also very important and a Fodder Specialist has recently been appointed to take up the work. As mentioned above, the Indian Central Cotton Committee has come forward to help us in the cotton work, thus enabling the Economic Botanist to give more attention to wheat and other cereals. A Botanist has been sanctioned recently to work on leguminous food and fodder crops.

With the very scanty attention which has been possible to give the date palm culture, a quality of date fruits never before grown in the Province has been produced in Muzaffargarh. These dates are in demand far beyond the confines of the Punjab at 8 annas per lb. packed in one lb. boxes, while ordinary dates grown in gardens along side of these sell at Rs.2 to Rs.4 per maund (82½ lbs.). If skilled attention were directed to the other fruits mentioned above, which are even now cultivated, much could be done to increase the profits from garden lands, and much larger areas of these crops would be grown.

Among vegetables, the department has only touched potatoes, and here again it has been able to increase the farmer's profits in the Simla hills substantially, but practically the whole field of work on fruits and vegetables in the Province is still unexplored. Matters like tinning, pressing and drying and otherwise preserving fruits and vegetables, which in other countries are taken up by private enterprise, but are in India left to Government to tackle, have not yet been touched for want of time and staff. Also there is a great deal of useful practical knowledge among horticulturists which ought to be collected and made public. There is an immense field of useful work that may be done. In brief research work on fruits gives great promise of adding rapidly to the fruit supply and well being of the people of the Province. A Fruit Specialist is just being appointed, and it is proposed to appoint a Vegetable Specialist in the year 1929.

It is proposed to have a Botanist for millets next year, and one for oil-seeds in the year following. There is no Mycologist in the Province, and so far the Mycological problems have been tackled by the Economic Botanist as far as time and facilities have permitted. A Mycologist and staff are proposed to be added to the Agricultural Department in 1928-29. The appointment of all these officers will help the department to tackle some of the crops and problems, which for want of staff it has not been possible to investigate satisfactorily. Another important line of work which this department is about to undertake, is investigations, connected with the large number of medicinal plants, which grow wild in the hills and plains of the province. There is great scope for developing a lucrative trade in the supply of drugs in India, and to foreign countries. Much useful work is awaiting in this direction, and it is proposed to put an Agricultural Assistant who is at present under training, on this work this year. He will

work in close touch with the Medical Department which will carry out the actual research connected with the medicinal properties of these drugs. This Assistant will be also in charge of the Herbarium at Lyallpur.

The five years' programme of development of the department will show further details regarding the staff which it is proposed to employ on botanical work.

I may also mention here that in the Entomological Section a great deal of work has been done which affects the yields of crops. The life history of many pests of important crops have been studied, and improvements have been made on the known measures for their control.

Sugar cane, maize and *jowar* stem borers have been studied. The proportion of affected plants of these crops was in some cases found to be as high as 36 per cent., while in the wild *baru* grass (*Sorghum halepense*) the proportion was as high as 72 per cent.; therefore *baru* is apparently responsible for breeding a large number of borers. Removal of the stubbles after harvest seems the most effective and practical method of checking the ravages of these pests.

A close study of the spotted boll worm (*Earias insulana*), its parasites, food plants, etc., has been made, and a considerable amount of light has been thrown on the subject. The use of parasites in affected fields appears to be a useful method of control, and consequently the Entomological Section undertakes to supply, free of cost, parasite boxes to farmers who apply for for them. Preliminary studies on the pink boll worm (*Platyedra gossypiella*) indicate that it is a regular pest in the South-East Punjab, but is far more rare in the Montgomery and Lyallpur Colonies and further west. An explanation of this is being sought for. The Indian Central Cotton Committee are greatly interested in this pest, and are financing a five years' scheme for further research and investigation on it, in the Punjab.

Cotton stem borers and other cotton pests are being studied. The removal of sticks from the fields, as soon as possible after the cotton crop is picked is recommended for the stem borer, and propaganda to this end has been started. The *kuttra* caterpillar (*Amsacta Sp.*) which does extensive damage by eating up the young plants of summer crops, has been very successfully dealt with by means of light traps. The question of preserving stored grains from insect attack is also receiving attention and so far super-heating the godowns seems the most promising method of dealing with the pests concerned.

Many fruit pests have been tackled and good results have been got. For example, in the control of the mango hopper which does extensive damage to the mango crop, spraying with rosin compound has been very effective. *Citrus psylla*, a serious pest of citrus trees in the province, has been successfully controlled by spraying affected plants with a tobacco decoction.

Good work has been done in the rat campaign already mentioned on page 98.

Another important investigation now receiving the attention of the section is the food of birds, the object being to discover the usefulness or otherwise to agriculture, of some of the commoner birds, so that measures may be taken to check the foes, and to favour the multiplication of the friends.

In the Entomological, as in other sections, much work awaits to be done. Extensions to its buildings are also an urgent necessity and are being provided for.

QUESTION 12.—CULTIVATION.—(*i*) The *deshi* plough is not an efficient tillage implement. It does not invert the soil, nor does it stir up the soil thoroughly and deeply unless the ground is ploughed many times, which of course the farmer cannot afford time to do. This plough is also used as a seed drill, a hoe, a cultivator, etc.

Improvements in tillage can be made by making increasing use of modern furrow turning ploughs, for example, the Raja, the Hindustan, the Meston,

and many others. These cultivate the soil far more thoroughly than the *desi* plough and also invert it.

The Agricultural Department has recently evolved several cheap seed drills which, in unit time, can sow three to four times the area that can be sown by the use of the *deshi* plough. These are now becoming available to farmers, and their use will cheapen cost of production, and increase the areas that can be sown when the land is in *wattar* (period in which the land is neither too wet nor too dry for sowing). Implements such as the simple bar harrow made by the department, the spring tined harrows, etc., also cover far more ground in unit time than the *deshi* plough when used with the object of producing a loose soil surface.

In an arid climate such as we have in most parts of the Province conservation of moisture is of very great importance to farmers. Dry wind sweeping over the surface of a fairly compact soil very soon dries it up, and hardens it so that it often becomes difficult or impossible to plough. The period of *wattar* is often only a few days duration and in many *barani* districts (watered by rainfall) the area which can be put under crop depends on the area which can be ploughed during the *wattar* period after a shower of rain. What is needed by farmers therefore is an implement which will roughly stir the surface of the largest area of land in the quickest possible time. The spring tined harrow, for example, can break the surface of about five acres in a day while a plough can only break the surface of about one acre. With the spring tined harrow the stirring of the soil is not so thoroughly done as in the case of careful ploughing but it is sufficient to greatly retard evaporation of the moisture and allow the farmer time to go back over the same area and cultivate it better at leisure.

To loosen the surface of land under wheat, the ordinary bar harrow is very useful as it covers a great area in unit time.

The sowing of cottons and maize in lines is another important improvement on the old method of broadcast sowing, as the crop can then be inter cultured by bullock power.

Again there is much more to be learnt about the economic use of water than is at present known, and I personally think that we should open, as early as possible, the Hydraulic station at Lyallpur suggested at page 10 of my original five years' programme for the Agricultural Department. Experiments with deep and shallow cultivation, sowing of cottons broadcast, *versus* in lines, etc., have been made for many years. The results are in favour of deep cultivation and sowing in lines.

One of the most important obstacles to the better cultivation of the soil, and to improved farming in general is, in my opinion, the *batai* system of leasing lands which always gives the landlord a large share of any improvement effected by the tenant. A cash rent system gives a far greater incentive to farmers to strive to improve their methods of farming, and with more education among farmers this will become more common.

(ii) Fertility in the plains of the Punjab is maintained chiefly by bare fallowing and green manuring. The store of nitrogen in the soil is also increased by growing leguminous crops. Farmyard manure is scarce owing to the fact that much cow dung is burnt as fuel, and artificial manures have not yet proved themselves to be very paying where ordinary extensive cultivation is practised.

In the canal colonies the chief rotations are wheat, *toria*, cotton, or two crops of wheat in succession then *toria* and cotton; but this is interrupted by the fact that about 1½ acres of sugar cane, about the same amount of maize, and some fodders are usually grown. The maize is usually manured, then that crop is followed by *senji*, and that in its turn by sugarcane and then wheat. The manure is usually put on to the maize, as direct manuring to sugarcane delays ripening. This delay is of importance as in the Punjab the whole cane season is required in order to ripen cane before the winter cold sets in.

Experiments with various rotations have been carried out at the Agricultural Farm at Lyallpur for a number of years now, and the results indicate that a more intensive rotation could be practised with advantage to the farmer. Details can be given by the Professor of Agriculture who is in charge of this farm. At the Gurdaspur and Hansi Agricultural Stations rotational experiments are also in progress.

Green manure has been found to be very profitable wherever tried in the Punjab plains, and to encourage the practice Government charges no *abiana* (water rates) for a crop grown and ploughed in as green manure.

A common *chahi* rotation (area irrigated by the wells) is wheat, maize, *senji* and sugarcane, or wheat, cotton, senji and sugarcane; but small areas of tobacco, potatoes, melons and other vegetables are also grown in suitable places.

The common *barani* system of farming is wheat or gram or barley in the *rabi*, followed by *chari*, *moth*, *mash*, *til*, or cotton in *kharif*, and then a whole year's fallow.

A more intensive study of these rotations is needed.

It is now being realised that in order to farm successfully an accurate knowledge of costs of the various farm operations is extremely important; consequently an incessant demand has arisen for information on this and other questions relating to farm economies. The Department feels the need of a Professor of Rural Economics with a staff of agricultural assistants working under him as Investigators, in order to furnish as accurate information as possible regarding the cost of raising crops in different localities and conditions. This information would place agricultural officers in a position better able to advise farmers as to the most economical rotations and systems of farming in particular conditions. There is a great field of useful work in this line for such staff.

QUESTION 13.—CROP PROTECTION INTERNAL AND EXTERNAL.—(i) Under the Destructive Insects and Pests Act of 1924, the Governor-General in Council is empowered by Notification in the *Gazette of India* to detain, inspect, disinfect or destroy any article or class of articles likely to cause infection to any crop.

I understand that the necessary measures are carried out by the ordinary Customs Officers who have no special knowledge of the diseases, but I have not had any opportunity to look closely into their methods. An exception to this, however, is the case of fumigation of bales of cottons entering India, which is done in Bombay under the supervision of the Indian Central Cotton Committee.

(ii) No measure exists in the Punjab for the prevention or control of pests and diseases coming from other Provinces, or from one part of this Province to another.

It is very desirable to adopt internal measures against infection. For example, the San Jose Scale on fruit trees in Kashmere is probably a menace to the Punjab. The Entomologist to Government, Punjab, informs me that this disease is already in Kotgarh in the Simla Hills, and I have asked him to tell me, after experiments, whether the disease is likely to flourish on fruit trees in the Punjab plains if it is introduced there. Speaking generally, I am of opinion that the first thing to be done for the control of pests and diseases is to educate public opinion as to their dangers, and that extensive, strenuous, persuasive propaganda is needed for this purpose.

I feel that we urgently need a special propagandist officer in the Agricultural Department to deal with this, and the many other phases of propaganda work required on matters connected with the development of agriculture. Legislation must follow propaganda, but it will be impossible to work legislation satisfactorily until public opinion is educated to realise its advantages.

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Legislation has been tried in Madras under the Madras Agricultural Pests and Diseases Act of 1919. Palmyra disease, cotton stem-borer, water hyacinth, etc., have been brought within its scope, but there has been a great deal of friction in the attempts to work this Act, and it seems to me that more propaganda was needed before the introduction of legislation there.

QUESTION 14.—IMPLEMENTS.—(a) To make the case understandable I give below a brief history of the work done on implements in the Agricultural Department together with contemplated measures for development:—

The first efforts towards the introduction of improved implements date back to 1907 when Mr. Milligan, the first Deputy Director of Agriculture, working in collaboration with a firm of agricultural implement manufacturers in Scotland evolved the Raja plough which has so far stood as a model for further attempts to evolve furrow turning ploughs suitable for the Punjab. The Raja Reaper, which is now commonly used in the Punjab wherever conditions are favourable, was also introduced by the same officer after a number of modifications and alterations had been effected to suit the conditions of this Province. In the process of evolving these implements, however, there was much waste of money and time as the firm in Scotland had to carry out Mr. Milligan's ideas largely from written correspondence, and had to send the resulting specimens of implements all the way from Scotland to India for trial. Much need was felt for an Agricultural Engineer and a workshop at the Agricultural Institute, Lyallpur, for work on implements and for other work of the department. Mr. Milligan, however, was greatly interested in agricultural implements and machinery, and made the best of the circumstances in which he found himself; the result being that since its very inception the Department of Agriculture in this Province has given a good deal of attention to agricultural implements. The lines followed have been in the main two, *viz.*:—

(1) The testing and introduction of modern implements and machinery as they were found in the world's market, and the modifications of these to suit local conditions;

(2) the improvement of indigenous implements.

As early as 1906 furrow turning ploughs, reaping machines, winnowing machines, fodder cutters, &c., were introduced by Mr. Milligan, and by 1909, 68 reaping machines, 102 furrow turning ploughs and 112 fodder cutters were in use in the Province.

In order to make improved implements available to zamindars, the department instituted argricultural machinery depôts at which modern implements recommended by the department, and spare parts were stocked. Efforts were also made to get private firms to take up the stocking and sale of these implements and spare parts. The agricultural department depôts ceased to function in a locality as soon as private firms had established themselves and the zamindars had facilities to get from them what was required at reasonable prices.

In 1914 the department started the manufacture of simple improved country implements at the Lyallpur Agricultural Farm, and since then this sort of work has been taken up at the other experimental farms in the department.

In 1915, when the Agricultural Engineer was appointed, further work on the adaptation of modern implements to fit local conditions, and on improving country appliances, was taken in hand. Even at that time, however, the duties of the Agricultural Engineer in catering for the wants of the specialists at the Lyallpur College and Research Institute; the course of instruction in engineering given to students; the well-boring work scattered over the whole Province, &c., &c., left the Agricultural Engineer little time to devote to agricultural implements and machinery. Nevertheless valuable work has been done.

Among the more important novelties and improvements put forward are a flexible harrow and a parallel cultivator or horse hoe, comprising the essential features of such implements and eliminating the objectionable features in the modern types. This hoe has been produced in India at a little more than half the cost of the imported article. A *bhusa* or chaff-cutting and pressing machine was devised, and has been incorporated in threshing machines made by a British Company. A simple make of seed drill for line sowing at a uniform seed rate was devised, &c.

In this connection mention should also be made of the new method of building reinforced concrete work which the Agricultural Engineer has devised in the course of experiments connected with the designing of silos and grain bins. This method eliminates the use of all forms of wooden shuttering, and thereby reduces the cost of construction by 15 to 30 per cent. according to the nature of the work under construction. In concrete work the metal used for reinforcing requires to have a certain thickness of concrete over it as a protection from corrosion, and this fact is taken advantage of in the method mentioned as the concrete forms its own mould of form. The system is obviously of very considerable economic importance, not only to the Agricultural Department, but to the Railway and Public Works Departments, and to others using concrete for constructional purposes. Numerous other lines of work have been undertaken as occasion has arisen, and many draft sketches have been prepared with the object of improving or simplifying various implements and machines, but shortage of staff has prevented the developments of a large number of these ideas. The Agricultural Engineer states that progress in designing implements suitable for use in this country could be very much more rapid if trained assistants and qualified draftsmen were provided to work up the ideas put forward. This has been recognised and the five years' programme of development recently prepared provides for one Assistant Engineer, one draftsman and one tracer to work up ideas on implements.

During all these years the Deputy Directors of Agriculture have been busy at their work on improving the simpler country implements. Bar harrows, seed drills, etc., have been the result and these are being largely adopted by cultivators.

Statements showing the numbers of various kinds of improved agricultural implements sold in the Punjab from the year 1914-15 to the end of June, 1925, are given below:—

Statement showing the sale of improved agricultural implements in the Punjab from the year 1914-15 to 1924-25.

Serial No.	Name of implements.	Implements Sold.										Remarks.
		1914-15.	1915-16.	1916-17.	1917-18.	1918-19.	1919-20.	1920-21.	1921-22.	1922-23.	1923-24.	1924-25.	
1	Furrow turning ploughs (Raja plough and others).	204	281	471	104	132	232	171	153	1,077	640	832	The number of implements sold from 1909-10 to April, 1914 is given below—
2	Meston ploughs (imported).									524	841	1,234	Raja ploughs 581
3	Meston ploughs (manufactured in India and by local blacksmiths).	*664	*906	*1,264	*557	*153	*76	*548	*1,565	1,630	6,914	3,263	Meston ploughs 413 Other ploughs 30
4	Reapers ...	186 Raja reapers and mowers were bought by zamindars from 1909-10 to April 1914.	—	—	10	—	8	5	2	5	3	4	Spring tined harrow 156 Hoes of sorts 61 Fodder cutter 243
5	Hoes, harrows and cultivators.	47	68	66	41	25	62	29	25	73	29	65	
6	Fodder cutters ...	60	58	42	13	80	50	180	217	288	533	941	
7	Miscellaneous... ...	—	10	20	13	6	4	11	11	552	439	3,549†	

* Includes ploughs made in India and also by local blacksmiths.

† Includes 3,311 cane crushers.

Statement showing the sale of implements manufactured by the Agricultural Department from 1918-19 to 1924-25.

Serial No.	Name of Implements.	Implements sold.						
		1918-19	1919-20.	1920-21	1921-22.	1922-23.	1923-24.	1924-25.
1	Bar Harrows	330	432	513	215	218	320	508
2	Drills	125	187	141	92	269	234	35
3	Lyallpur Hoes	96	79	39	—	31	2	27
4	Miscellaneous	227	1,682	—	—	427	488	70

NOTE.—Exact figures before 1918 are not available.

It should be noted that the information given above is merely a record of the sales which are known. It is becoming increasingly difficult to keep in touch with the sales of modern implements that are finding their way into the Province through various agencies and local manufacturers. Therefore, it is probable that far more of these have been purchased of late years by farmers than the departmental records show. In the earlier years most zamindars came for advice before purchasing, and ordered the implements they required through the department. Now they go direct to firms and purchase for themselves. This is a sign of progress, as it indicates that farmers are gaining confidence in the use of these implements. Light furrow turning ploughs of the Meston type are now manufactured on a fairly large scale by several firms in the Gurdaspur district, also in a number of villages in other districts. The local make is not as good as the foreign makes, but the fact that their manufacture has been taken up is evidence of the demand.

It will be noticed that we know of the sale of over 20,000 Meston ploughs during the period mentioned, and that these are by far the most popular implements. The reason is that the Meston, although a furrow turning plough, most nearly resembles the *deshi* plough. It is light and, most important of all, it is very cheap, costing only Rs.7 to Rs.10. This plough does good work on light soils. Of late years, however, the heavier furrow turning ploughs of the Raja type are becoming much more in demand. They are more thorough in their work, and are essential if farmers are to get the best results in heavy lands and lands badly infested with deep rooted weeds. They are, however, about four times the price of the Meston, and this is a consideration with farmers.

Another article worth mentioning is the fodder cutter. There is now a great demand for these, and this is a point of importance, as the use of these machines effects considerable economy in the amount of fodder required for cattle. Local firms have also started to manufacture these machines.

An implement of great importance to the farmer is the spring tined harrow. After land has been watered by rain or by irrigation water, it remains in a fit state for working only for a few days, but if the surface of the soil is broken during that time, tillage operations may be extended over a much longer period. A pair of bullocks with a spring tined harrow can break the surface of about four acres of land in a day, whereas a pair of bullocks with a *deshi* plough can only break one acre in the same time. Therefore the spring tined harrow enables farmers to make far better use of any rainfall or irrigation water. This implement is of special importance

in *barani* (rainfall) tracts, where it may enormously increase the area which a farmer can put under crop in years of scanty rainfall during the period of preparation of the land for sowing.

The utility of reapers is appreciated, but the costs are still very high, being about Rs.450 landed in the Punjab. Therefore there is little prospect of reapers being sold in large numbers until either their prices are reduced, or the costs of labour are further enhanced.

Steam power threshing machines have been under trial for a number of years, but imported makes have not so far been found very suitable for the Punjab. Work has also been done in winnowing machines, etc., etc.

Motor tractors have been tried for a number of years in various parts of the Province, but were not a success owing to frequent breakdowns, even where fairly well looked after; the difficulty is in getting spare parts, etc. It has been agreed that an important cause of these breakdowns was the fact that the machines were working too near their maximum power. One higher power tractor for trial has recently been purchased and another has been ordered. The result of these purchases will be watched with interest.

Experiments are proceeding with steam cultivation on the farm of the Hon'ble Sardar Jogendra Singh at Iqbalnagar. Steam cultivation is also employed on the department's Bara Reclamation Farm at Kahuta, near Montgomery.

The introduction of modern implements and machines has been greatly hindered by the fact that an ordinary labourer on a farm does not understand them, and the local blacksmith, for the same reason, is unable to effect adjustments and repairs. To help in this difficulty the department has for many years sent out mechanics to do simple repairs when requisitioned, also the staff on district work assists in putting things right when the trouble is slight. To further reduce this trouble the short course for *lohars* (village blacksmiths) already mentioned has been started in the Agricultural College, Lyallpur.

It should be mentioned also that during the last few years considerable progress has been made as regards availability of imported implements and their spare parts. A number of European and Indian agencies who import modern implements have established themselves in various parts of the Province, and the range of implements for selection has much improved. The farmer is no longer tied down to one type of plough, fodder cutter, reaping machines, etc., but in most things he has now a choice between two or more makes. Spare parts of all these implements and machines are to be had from these firms, who under the stimulus of competition now keep mechanics who can explain the working of their wares.

Ploughing competitions and methods adopted to popularise improved implements have been discussed on pages 50 to 52.

(*b*) Kindly see reply to (*a*) above; also pages 58 to 60 and 128. As the prices of a number of these implements are high, the question of payment by instalment may be considered in cases where that is necessary.

(*c*) The chief difficulty which manufacturers of agricultural implements have to face is that they are not in close enough touch with agricultural conditions and the needs of farmers to evolve improved implements. Little progress can be expected unless an engineer who has considerable knowledge of agricultural implements and operations works in the closest collaboration with farmers. It is by no means an easy matter to evolve improved agricultural implements; to adapt foreign makes to the needs of the country, or to improve the local ones, and this work will always be very expensive.

Firms are now making greater efforts to get in close touch with farmers by sending out their representatives to districts or through the officers of the Agricultural Department, but it seems to me that the Agricultural

Department will always have to take a large hand in the evolution of improved implements owing to the fact that improvements effected are usually extremely expensive and often not worth the while of a single private firm which will frequently be unable to retain a monopoly of the improvement when it is effected.

Firms are now asking for the services of men trained in the Agricultural College to represent them among farmers. This is a step forward.

There is little difficulty in the distribution of any implement of real value. Distribution is done by the agents of the firms direct to the public or through the Agricultural Department. To help farmers in this respect the Agricultural Department tests implements for firms and informs them of the results. It also informs farmers regarding these and advises them as to what implements they should purchase.

QUESTION 15.—VETERINARY.—(*a*) For about four years I have held charge of the post of Director of Agriculture, Punjab, which includes charge of the veterinary work in the Province, and from my experiences in that post I am convinced that the separation of the veterinary work from the charge of the Director of Agriculture would be a seriously retrograde step. I will make a few remarks in explanation.

Re Veterinary Education.—The training of the subordinate veterinary staff is done in the Punjab Veterinary College, but as a knowledge of veterinary work is an essential part of the training of an agriculturist, courses of veterinary instruction are also given in the Lyallpur Agricultural College to all students who take the B.Sc. degree in Agriculture, to the students of the two years' Leaving Certificate Course, and even to students of the Vernacular course.

To do the veterinary teaching work at the Lyallpur College a Veterinary Assistant is stationed there, and he makes use of the Veterinary Hospital at Lyallpur, which is directly under the control of the Chief Superintendent, Civil Veterinary Department. With the veterinary and agricultural work under the Director of Agriculture, there is no trouble in getting a suitable veterinary teacher and in giving him his promotion in the Veterinary Service in due time, nor is there any difficulty in arranging for patients and other facilities at the Veterinary Hospital, Lyallpur, for teaching the students in the Agricultural College. If, however, the two departments were separate the situation would become much more difficult as regards the procuring of suitable teachers and giving them their promotion in the Veterinary Department in due time; a special veterinary hospital would almost ceretainly have to be built for the Agricultural College and the veterinary teacher would have to make special arrangements to procure ailing animals for students for demonstration and practical work. This arrangement would therefore be more expensive and less efficient than the present one.

Re Veterinary Research.—The separation of the two departments would reduce facilities for work which at present exist. For example, Government has recently sanctioned the entertainment of a temporary staff for a survey of flies of the province which appear to be connected with the spread of disease among farm stock, and it is difficult to get qualified men for such temporary posts. At present, if efforts to recruit a suitable man fail, the Director of Agriculture, being head of both Veterinary and Agricultural Departments, may be able to arrange to put one of the trained entomological staff of the comparatively well equipped Entomological Section of the Punjab Agricultural Research Institute on to this work and re-absorb him in the Agricultural Department when the work is finished. Again, a qualified man in the open market would be more ready to take up an entomological post in the Veterinary Department if both departments are under the Director of Agriculture, as the Director would obviously do his best to absorb a useful man in the Entomological Section of the Agricultural Institute when the temporary work in the Veterinary Department is finished.

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Then again the collection of entomological specimens, and the information which is now in the Lyallpur Institute, must be of more use to the staff on the Veterinary Fly Survey if both departments are under one Director than they would be if under two separate men, as closer co-operation and collaboration can be insisted on. In the case of other work also the present system has advantages. For example, the Agricultural Chemist at Lyallpur is dealing with problems of animal nutrition, and collaboration with veterinary officers should be useful. The Bacteriologist at Lyallpur must be of use to the man we are searching for to take up work on the surra disease of camels, cows, horses, &c.; and also to the research officer and the Pathologist that we want for the Punjab Veterinary College. The Botanist at Lyallpur with his comparatively well equipped Herbarium must be useful as regards identification of poisonous plants and so on, and so on. In short, all the researchers in the Agricultural and Veterinary Departments working together as a team would be far more economical to the Province than if they work separately. These departments are but beginning their work, and as they develop the necessity for close collaboration will become the greater.

As regards the treatment of diseases of farm animals in the districts and the desirability of that work being controlled by the Director of Agriculture, it seems to me that these diseases are as closely connected with the welfare of the agricultural community as the diseases of plants are, and if the Director of Agriculture has gone through a general course in agriculture, and is given a competent staff of veterinary officers, he should have no more difficulty in dealing with the veterinary work than he has in dealing with the work in other special branches under him, viz.:—Entomology, Mycology, Bacteriology, Chemistry, Botany, &c. The Director of Agriculture is expected to decide the general line of work to be followed, and co-ordinate, control and direct that work in the best interests of agricultural improvement and development; the specialist in charge of each of these sections is expected to supply the technical skill and to carry out the work in detail. In his own interests the Director of Agriculture will see that the phases of the work which he selects to press on, fit into the general programme of development, whereas if the veterinary work were separately controlled this co-ordinating influence would be lost, and if the heads of the two departments were both keen officers there would be room, where none exist at present, for differences of opinion and friction with all its possibilities of delaying progress and wasting money. For example, there would be room for friction as to restrictions in movements of cattle in districts; the desirability of holding cattle fairs, &c. Again the veterinary staff, who are naturally tied to a considerable extent to the Veterinary Hospitals, complain that cattle diseases are not promptly reported to them; but with an agricultural staff scattered all over the province, and whose duties are to move from place to place, it seems to me wasteful if we do not make the fullest use of this latter agency, not only in reporting diseases and controlling the movements of cattle, but in persuading farmers to adopt preventive measures. The more I study this question with a view to increasing efficiency and economy, the more convinced I am that the closest possible collaboration between the agricultural and veterinary staff will be a benefit to the province, and, as stated at the outset of the answer to this question, I think it would be a retrograde step of a serious nature to separate these departments.

Re cattle breeding work.—Here, in the Punjab, cattle breeding is in the process of separation from the Veterinary Department. The district cattle breeding work has been left for the present under the Chief Superintendent, Civil Veterinary Department, while the Government cattle farms and grantee farms have been placed under a Live Stock Expert. This Live Stock Expert has been chosen from the Civil Veterinary Department, not because he is a Veterinary Officer, but because he happens to be a born farmer and already has extensive knowledge of cattle breeding in the Punjab.

in case a word of explanation is needed as to why cattle breeding should eventually be in the Agricultural and not in the Veterinary Department I make a few remarks below.

In the first place every Agricultural Assistant, and every Extra Assistant Director of Agriculture who has gone through the Lyallpur Agricultural College: also every Deputy Director of Agriculture in the service has had a course in animal husbandry, including subjects dealing with milk production and disposal, work cattle, their points, how they are fed, what they are required to do, &c., whereas the Veterinary Assistants who have gone through the Veterinary College, Lahore, and who are in charge of district work, have had no such training; also the whole life of the Agricultural Assistant is bound up with the problem of what work a bullock can do, how much milk a cow can give, &c., &c., while Veterinary Officers are occupied in combating disease. Again it is the Agriculturist the world over who has produced the breeds of cattle which are famous to-day, and it is worthy of notice that cattle specialist now being turned out of Colleges in other countries are agriculturists to whom a special training in animal husbandry has been given. In the Punjab, no Agricultural Officer can carry on his work efficiently and advise farmers regarding their holdings without being immersed in problems connected with the cattle. It is therefore right that the staff of the Agricultural Department should be compelled to take part in cattle work wherever possible. Such work will add to the efficiency of the Agricultural Assistants, and it would be a waste of men and money if they were not compelled to take part in this. At present, however, the members of the agricultural staff in the districts are too few in number to take over this work entirely, so they and the veterinary staff must work in the closest co-operation in this matter for a number of years at least. This being so, I do not see how the departments could be expected to work better under two separate officers, and, indeed, I am of opinion that in the interests of efficiency, economy and smooth working they must continue to work together on district cattle breeding work.

As already stated, the Chief Superintendent of the Civil Veterinary Department is in immediate charge of cattle breeding work in the districts, while the Live Stock Expert is in charge of Government cattle breeding farms, and is the inspecting officer of the Government grantee cattle breeding farms in the Province.

The position of the Live Stock Expert as regards the district work on cattle breeding is exactly that of any other specialist in the Agricultural Department, i.e., he is the expert adviser in his subject, and will get his district work done through the Chief Superintendent or the Deputy Director of Agriculture concerned. I mention the Deputy Directors of Agriculture as we are on the eve of adding a cattle breeding section on a small scale to the headquarters experimental farm for each of the eight agricultural circles proposed for the province. The Chief Superintendent, Veterinary Department's position relative to the Live Stock Expert is the same as that of a Deputy Director of Agriculture.

(*b*) (i) Yes. Veterinary Hospitals are under Local (District) Boards, but they are supervised and guided technically by the staff of the Civil Veterinary Department. The hospital buildings are provided by District Boards, but of late Government has given grants-in-aid for the building of some of these, *vide* answer to (*b*) (ii) below.

The equipment and maintenance charges of hospitals including medicines, &c., are always paid by the District Boards. The following menial staff, viz:—

One compounder on Rs. 25 per mensem,
One *bhisti* on Rs. 13 per mensem,
One sweeper *cum chaukidar* on Rs. 13 per mensem,

are also provided by the District Board.

The Veterinary Assistant in direct charge of the hospital is paid by Government. His pay ranges from Rs. 60 to Rs. 90 in the case of the Veterinary Assistants who went through the old Vernacular Veterinary courses and Rs. 100—10—300 in the case of the new Veterinary Assistant Surgeons.

The system works well.

Re. (*b*) (ii)—The following statement shows the number of hospitals in existence in the years ending 31st March 1921-22 to 1925-26; the numbers of animals treated at these hospitals and on tour, the number of animals castrated and the numbers of inoculations, and vaccinations performed by the district staff:—

	For the years ending 31st March.				
	1921-22.	1922-23.	1923-24.	1924-25.	1925-26.
	Number of Veterinary Hospitals.				
	160	174	177	180	192
	Number of animals *treated at hospitals.*				
Cases brought to hospitals ...	361,505	411,034	496,720	540,878	601,090
Cases supplied with medicines, but not brought to hospitals.	62,130	103,832	80,289	106,386	104,114
	Number of animals *treated on tour.*				
	111,433	130,551	82,686	109,390	120,502
	Number of animals *castrated at hospitals.*				
	17,533	27,554	39,268	56,982	75,873
	Number of animals *castrated on tour.*				
	22,209	52,527	58,534	97,869	107,196
	Number of inoculations performed.				
Rinderpest	132,841	48,875	38,750	77,787	236,461
Hæmorrhagic Septicæmia ...	43,858	83,608	82,976	84,728	91,904
Anthrax	492	100	—	—	—
	Number of vaccinations performed.				
Hæmorrhagic Septicæmia ...	43,244	171,799	131,730	155,727	148,214
Blackquarter	5,674	11,799	16,141	17,833	22,665

It will be seen that the amount of work done at hospitals by the district veterinary staff has increased greatly during the five years in question. The locations of these Veterinary Hospitals are shown in the map enclosed.*

A considerable demand for new veterinary hospitals and veterinary assistance has arisen all over the Province and with a view to meet this demand a five years' programme of development of the district veterinary work extending from the year 1926-27 to year 1930-31 has been made out,—*vide* statement below:—

* Not printed.

1926–27.	1927–28.	1928–29.	1929–30.	1930–31.	Remarks.
1. 20 new hospitals...	1. 20 new hospitals...	1. 20 new hospitals...	1. 20 new hospitals...	1. 20 new hospitals	Total = 100 hospitals, of which 60 would be in special tracts.
2. Grant-in-aid of Rs. 1,20,000.	2. Grant-in-aid of Rs. 1,20,000.	2. Grant-in-aid of Rs. 1,20,000.	2. Grant-in-aid of Rs. 1,20,000.	2. Grant-in-aid of Rs. 1,20,000.	
3. 12 Extra Veterinary Assistants. 4 for Dhanni tract	3. 12 Extra Veterinary Assistants. 4 for Dhanni tract	3. 12 Extra Veterinary Assistants. 2 for Dhanni tract	3. 12 Extra Veterinary Assistants. 2 for Dhanni tract.	3. 12 Extra Veterinary Assistants. 2 for Dhanni tract.	Total=60 extra Veterinary Assistants—14 for Dhanni.
4 for Hariana ...	4 for Hariana tract.	6 for Hariana tract.	8 for Hariana tract.	8 for Hariana tract.	30 for Hariana.
4 for Epidemic tract.	4 for Epidemic tract.	4 for Epidemic tract.	2 for Epidemic tract.	2 for Epidemic tract.	16 for Epidemic tracts.
4. 1 Superintendent...	4. Northern Circle to be separated from North-West Frontier Province.	4. 1 Superintendent	4. 1 Superintendent	4. 1 Superintendent	
2 Deputy Superintendents.	2 Deputy Superintendents.	2 Deputy Superintendents.	2 Deputy Superintendents.		

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It will be seen that the proposal is to open twenty new hospitals per annum also that a grant-in-aid of Rs. 1,20,000 is to be used to assist District Boards to construct Veterinary Hospital buildings. Most District Boards are financially poor and the money will be distributed amongst the most needy District Boards in places where the hospitals are urgently required. Further it will be noticed that twelve Veterinary Assistants are to be recruited per annum for work in the Dhanni and Hariana cattle-breeding tracts and low-lying localities where epizootic diseases are specially prevalent.

As regards the Provincial Service veterinary staff, we have five Deputy Superintendents at present, and it is proposed to recruit two Deputy Superintendents per annum for the next four years, which will give us thirteen in all, or nearly one Deputy Superintendent for every two districts.

Re the superior staff, the Province is divided into three veterinary circles, viz.:—North Punjab, South Punjab and Central Punjab, each is under the charge of a Veterinary Superintendent, the Superintendent of the Central Punjab being also Chief Superintendent with jurisdiction over the other two. It is proposed that the Province be divided into five veterinary circles as soon as possible with a Superintendent in each and a Chief Superintendent for the Province.

I have already noted—(*vide* Government letter No. 1012-D.S., dated 13th September, 1926, to the Liaison Officer to the Royal Commission) that at present the Superintendent, North Punjab, supervises the veterinary work of the North-West Frontier Province, and that the remaining veterinary staff of that province has no other connection with the Punjab than that it comes under the orders of the above-mentioned officer. The proposal is that the North-West Frontier Province should take over the supervision of its own veterinary work as soon as possible in order to relieve the Superintendent, North Punjab, of that duty. This will do much to meet the growing demand for district veterinary work.

There are some District Boards which are so poor that they are unable to maintain a larger number of Veterinary Hospitals than they are already maintaining unless they get some help from Government and this question may have to be further considered.

Re (*b*) (iii) Kindly see reply to (*b*) (i) above.

(*c*) (i) It will be seen from the statement shown in the reply for question (*b*) (ii) above that rapidly increasing use is being made of Veterinary Hospitals and veterinary staff on district work.

The popularity of these Veterinary Hospitals depends mainly on two things (*a*) the quality of the work done by the Veterinary Assistants in charge, and (*b*) the education of the farmers.

To my mind, a high standard of education amongst Veterinary Assistants is of vital importance. In this connection I may mention that up to the year 1921 the Veterinary Assistants employed in the department had undergone a three years' vernacular course in veterinary work in the Punjab Veterinary College, Lahore. From 1921, students have been taken into that College for a four years' diploma course of a very much higher standard than the previous one there. The medium of instruction of the more recent course is English and is intended to produce professional men possessing a sound knowledge of Veterinary Science in all its branches erected on a foundation of logical reasoning. The men who have taken this diploma are now coming out of the College and will doubtlessly raise the standard of work which will be done in the districts. These men are designated Veterinary Assistant Surgeons and are to be posted as a

rule to the most important hospitals in the Province. The starting of a course of a lower educational standard to provide the men to man the less important hospitals is under consideration.

As regards the education of farmers, agricultural education in various forms with the aid of propaganda is being pushed on by the Agricultural Department. As already stated, every lad who goes in for the diploma course, the leaving certificate course, or the vernacular course in the Punjab Agricultural College, goes through a course in veterinary work, and as they are drawn from middle class farmers all over the province, and they discuss agricultural matters with people they meet in the exercise of their duties, and with their relatives and friends on their return home, they are a powerful influence in spreading knowledge amongst the agricultural classes. The position will also be greatly improved by means of the lectures, cinema films, &c., which the Agricultural Department is arranging for—(*vide* reply to Question No. 3).

(ii) There are no touring dispensaries in the Punjab. In 1907 one post of itinerary Veterinary Assistant was sanctioned for each district, in addition to the stationary Veterinary Assistants posted there. The intention was to continue these until one Veterinary Assistant had been posted to each *tehsil*. In 1922-23 this stage was passed as 174 Veterinary Hospitals were then at work in the 115 tahsils of the Province and the system was stopped. It may be mentioned that the system was not considered very satisfactory.

The men in charge of Veterinary Hospitals tour a little, especially in connection with outbreaks of contagious diseases.

(*d*) Ignorance is the most serious obstacle. This as noted above, is being attacked by the Agricultural Department, through college education and propaganda.

Also Government has budgeted for Rs.1,500 to be given as rewards to *patwaris* for prompt notification of contagious diseases, and I have recently ordered the agricultural staff on district work to devote more attention to this work. I do not advise legislation just yet, as it would be misunderstood and most difficult to work. In my opinion there must first be a call for legislation by the agricultural community before we can expect it to work smoothly and well.

It therefore seems to me that extensive strenuous and persuasive propaganda is the most urgent need of the case.

The most serious loss that a farmer usually sustains is that of mortality of cattle through infectious diseases, and as soon as farmers realise that this loss can be reduced by measures such as segregation, disposal of diseased carcasses, compulsory inoculation, &c., there will be a call from them for protective measures. At first, villages may be allowed to take measures within their reach, then local bodies and finally provincial and wider legislation may be undertaken. At the rate at which we are going I do not think it will be long before a stage is reached when there will be a call for measures for protection of live stock from infectious diseases. Experience has shown that once any agricultural advantage is clearly proved, farmers are keen to adopt it. Let there be no doubt about the fact that we are dealing with farmers who are shrewd and as willing as we are to improve their lot. I have no complaint against them, and the duty before us is to give them proof that the measures we propose are really for their benefit.

The shortage of veterinary and agricultural staff is an obstacle to this, but, as already stated, measures to increase and improve these two staffs are in hand—(*vide* remarks under (*b*) (ii)).

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(*e*) No. There are no complaints of want of serum. Also Government has been very generous in the provision of funds. Money provided for this purpose during the past five years is given below:—

	Rs.
1921-22	78,000
1922-23	1,10,000
1923-24	1,10,000
1924-25	1,05,000
1925-26	1,30,000

I feel that the propaganda which we have been organising for the past year or more will do much to make serum far more effective, by informing farmers of the dangers of loss to themselves through the mixing of diseased with disease-free animals.

(*f*) Ignorance is the chief obstacle. No fee is charged in this Province.

(*g*) Yes, very much so. I feel that there is a great field for useful work here. Mr. Cross has already done classical work on surra disease of camels at the Sohawa Laboratory by the light he has thrown on the agents of transmission of the disease, and by his discovery of its treatment by intravenous injections of tartar emetic, &c.

During his Fly Survey he discovered many species of *Tabanidæ* flies which transmit the disease, also that these *Tabanidæ* lay their eggs on leaves of aquatic plants, on leaves of trees, and on rocks overhanging water; that *Tabanidæ* are more prevalent in a year of a good monsoon than in a year when the monsoon is poor, &c.

As a result he was able to point out that all low-lying swampy tracts and tracts bordering rivers and canals must be regarded as dangerous from a surra point of view, and that dry sandy areas are not so dangerous. During this fly survey much information regarding bot flies, ticks, &c., was also collected which will be of great value in dealing with other diseases of farm animals.

In short, Mr. Cross has opened up a whole field of research work with all sorts of possibilities of economic importance.

It seems to me that foot and mouth disease, hæmorrhagic septicæmia, rinderpest and other important diseases offer fields of research by which immense benefits could be conferred upon the province if qualified men are employed to investigate these.

In this connection I may state that Government has agreed to my proposal to place the Sohawa Research Laboratory under the Principal of the Punjab Veterinary College. That officer with his laboratories and specialists in a number of branches of veterinary work is in a position to give more advice and help to the Research staff in the Sohawa Laboratory than the officer-in-charge of district work was when the work was under him.

Government has also provided money for the engaging of a specialist to take the place of Mr. Cross who unfortunately has retired; and money has been provided for the continuation of the fly survey started by Mr. Cross.

A post for a research officer has also been sanctioned for the Punjab Veterinary College, and I will ask for a second research veterinary officer within the next few years. Colonel Walker and Mr. W. Taylor have done some work on foot and mouth disease and Mr. Taylor has done some work on the anti-rabic treatment of dogs, but these officers had little time to spare for research.

I feel that there is a large field for veterinary research work of great potential value to the Province, the fringe of which has hardly been touched, and that many more workers are needed.

Re (*g*).—(i) and (ii). The extension of the Provincial Veterinary Research Institution is essential, as many local problems can be much better investi-

gated on the spot, for example, the Fly Survey in the Punjab in connection with surra disease. There is no reason, however, why the Muktesar Institute should not be strengthened and take up the investigation of such problems as it is fitted for.

(*b*) (i) and (ii). If the Muktesar Institute could provide a better class of research officers than the Province can provide and these officers would be under the control of the Local Government as long as they are in their Province, I see no objection to this. Personally I would welcome any assistance which the Central Government could give.

QUESTION 15.—VETERINARY.—(i). No. I can see no advantages in this to the agricultural community, but I see obvious possibilities of having differences of opinion where none can exist under the present organisation. What is needed I think is that the veterinary officers in various Provinces shall be encouraged to meet together and discuss the problems which come before the provincial authorities.

For veterinary officers the institution of a post of Veterinary Adviser in each Province and a post of Veterinary Adviser to the Government of India would of course be an advantage in that they would have these higher posts to aspire to. This in my opinion is the chief cause of the call from veterinary officers for separation from the Agricultural Department.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) (i). The main policy in the Punjab as regards cattle breeding is the preservation and improvement of the indigenous breeds of cattle of the Province by a process of selection.

The three most important breeds of the Province are (1) Hariana—the home of which is in the south-eastern districts of the Province, (2) the Sahiwal or Montgomery breed which is typically found in Montgomery district, and (3) the Dhanni breed—the home of which is in the Jhelum, Attock and Rawalpindi districts.

The Hariana is the heaviest animal and is celebrated for its draught qualities; the Dhanni, which is also an excellent draught animal, is rather smaller and requires less food to keep it in good condition, while the Montgomery breed is specially celebrated for its milk yield. Schemes are in operation for the improvement of these three breeds.

The Hariana.—The main Government Cattle Breeding Farm at Hissar deals with this breed. The farm is about 40,000 acres in extent, and about 2,000 acres of it are under cultivation. The farm carries about 1,500 cows, and a total of nearly 6,000 head of stock. It turns out about 300 pedigree bulls per annum and a considerable number of other stock. Milking records are now kept, and an attempt is being made to turn this breed into dual purpose animals (see also annual reports). Proposals are under consideration for the extension of the cultivated area of this farm to 6,000 acres, and land is being set aside for the establishment of another 3,000 acre farm in the Nili Bar for the improvement of this breed. Also it is proposed to attach 150 acres of land to each of the eight experimental farms which are to be the headquarters of the eight Deputy Directors of Agriculture, and the following grants of land have been made by Government for the improvement of the Hariana breed of cattle:—

Name of farm.	Year granted.	Area in acres.	Required strength of herd.
1. Fazal Dad Farm ...	1916	3,140	6 bulls, 400 cows.
2. Bahadarnagar Farm ...	1916	3,131	6 bulls, 400 cows.
3. Qadarabad Farm ...	1915	1,000	3 bulls, 125 cows.
Total ...	...	7,271	15 bulls, 925 cows

Milk recording has been started at these grantee farms with the object of improving the milk yields in conjunction with draught qualities, and some comparatively good milk-records have been got.

A scheme to maintain and improve the Hariana breed in their home districts was started in 1922-23 the underlying principle of which is that pedigree bulls are provided from the Hissar cattle farm and sold to District Boards at Rs.250 per animal, part of the cost of the bulls being provided by Government, and the remainder by the District Boards concerned from local funds.

The District Boards of Rohtak, Gurgaon and Hissar now participate in this scheme and the total *number of bulls in it at the end of March 1926* was 660—(*vide* Table VII, page xx of *Annual Report of Veterinary Department* for the year 1925-26).

The following statement shows the sums of money contributed to the Hariana scheme by Government during the last three years:—

	Rs.
1923-24	*Nil*
1924-25	4,000
1925-26	16,000

As a rule, not less than half the cost is borne by the District Board concerned, but in the year 1925-26 Government agreed temporarily to contribute Rs.2 for every rupee contributed by the District Boards. This year the scheme is again on a 1/1 basis but the question of a 2/1 basis is under consideration.

The bulls are allowed to roam about with the village herd.

As regards the Dhanni cattle, the establishment of a farm of about 1,000 acres for the improvement of this breed of cattle in Chakwal District Jhelum, is under consideration.

The Dhanni.—A Dhanni Cattle Breeding Scheme to improve the breed in its home districts was started in 1919-20. Attock, Rawalpindi and Jhelum districts joined at first and the scheme has since been extended to Mianwali district. Briefly, it aims at the provision of selected bulls of this breed for District Boards, and the subsidisation of approved privately owned bulls of the breed. The contributions by Government and the District Boards concerned are on the same basis as in the case of the Hariana Scheme.

The following statement shows the sums of money granted by Government for the furtherance of this scheme during the last three years:—

	Rs.
1923-24	6,500
1924-25	8,500
1925-26	22,600

The bulls are selected animals purchased locally, and some are under the care of prominent men in the villages who are paid a maintenance charge of about Rs.15 per bull per mensem. Many others are privately owned bulls for which maintenance charges of Rs.8 to Rs.15 per month are paid. The total number of bulls at the end of March 1926 was 187—(*vide* page 31 of Annual Report of Veterinary Department for the year ending 1925-26).

A herd book of this breed is kept.

District Boards outside the Hariana and Dhanni Cattle Breeding Schemes have been allowed to buy pedigree bulls from the Hissar Cattle Farm at Rs.250 per animal, and in addition it is proposed now to give grants-in-aid to the poorer District Boards outside these schemes.

The number of approved herd bulls in various districts of the province in the years 1921-22 to 1925-26 were as follows:—

	No. of Bulls.
1921-22	1,537
1922-23	1,637
1923-24	1,774
1924-25	1,958
1925-26	2,253

The Sahiwal or Montgomery.—As regards the Montgomery breed of cattle, the following statement shows some particulars of the larger grants of land made by Government for the improvement of this breed:—

Name of farm.	Year granted.	Area in acres.	Required strength of herd.
1. Jahangirabad Farm... ...	1916	4,226	8 bulls, 500 cows.
2. Kot Allah Dad Khan Farm	1917	3,800	3 bulls, 125 cows.
Total	—	8,026	11 bulls, 625 cows.

In 1923 Government granted a further area of about 5,000 acres of land near Shergarh in the Montgomery district to *janglis* and Syeds on cow-breeding conditions. These grants are from half to two rectangles, each rectangle being 25 acres. The conditions require that the lessees maintain two approved cows per rectangle of irrigated land, and one cow per rectangle of unirrigated land, the cows to be of an approved breed and quality.

If the tenant conforms to all the conditions and pays all dues to Government he is entitled to get occupancy rights, and if he continues to pay all Government dues for five years more after the commencement of the tenancy he is entitled to get proprietary rights on payment of Rs.150 per acre.

Government has also reserved 15,000 acres of land in the Nili Bar for similar small grants for the improvement of the principal breeds of cat of the province.

In 1924 the canal water rate for fodders was Rs.3 per acre. In 19. the rate was reduced to Rs.2 per acre, representing a reduction in revenue to Government of Rs.16 lakhs approximately, and it now stands at Rs.2 per acre.

In addition 39 co-operative societies were at work on the improvement of cattle breeding.

I have mentioned the creation of a post of Fodder Specialist, and our proposed fodder farm, in my replies to question No. 16 (*b*). The extension of the well boring staff has been mentioned in my reply to Question No. 8 (*a*) (iii).

It will therefore be seen that a good deal is being done to encourage farmers to improve the main breeds of cattle in this province.

(ii) For the encouragement of the dairy industry the following grants of land have been made by Government:—

Name of farm.	Year granted.	Area in acres.	Required strength of herd.
1. Rakh Chandrai, Lahore Dairy Farm.	1922	1,137	6 bulls, 600 cows.
2. Montgomery Dairy Farm ...	1921	485	3 bulls, 150 cows.
Total ...	—	1,622	9 bulls, 750 cows.

I regret to say that the Rakh Chandrai grant has been so wanting in success that it is being resumed by Government, but the Montgomery grant is continuing. In this connection it must not be forgotten that a serious handicap in making dairying pay in India is the difficulty in getting rid, at a profitable price, of cows which have ceased to give a fair supply of milk.

As already mentioned milk recording has been started at the Hissar Cattle Farm and at all the cattle breeding farms already referred to. Also co-operative milk recording societies have been instituted on the Shergarh grants (referred to in Question No. 16 (i) above).

That considerable improvement can be made in milk yields by breeding and selection of the animals has been shown by the work at the Lyallpur Agricultural College dairy where the average milk yield of a herd of about 20 cows throughout the year including dry periods has been raised in the years 1914-15 to 1925-26 from 5·6 lbs. to 9·8 lbs. per day—*vide* statement below:—

Year.	*Average yield per day per cow.*
	lb.
1914-15	5·6
1915-16	5·4
1916-17	6·8
1917-18	7·18
1918-19	7·45
1919-20	8·6
1920-21	9·31
1921-22	7·27*
1922-23	9·1
1923-24	9·3
1924-25	9·03
1925-26	9·8

A scheme is under consideration for growing fodder on a farm of 1,140 acres some seven miles from Lahore, the idea being to induce *gowalas* (dairymen) to bring their cattle to the farm where they will be supplied with fodder at cheap rates provided that the cows are milked under the supervision of the Agricultural Department and that the milk is handled and sold under sanitary conditions. The idea is to assist in giving a better supply of milk to Lahore where many of the cows are kept in most unsanitary conditions and fodder is expensive. The state of affairs is similar in other towns of the Punjab.

(iii) Kindly see above replies to Question No. 16 (*a*) (i). Also researches have been started on the nutritive value of fodders in the Chemical Section of the Lyallpur Agricultural College. This is a beginning on work which should show what rations are most economical for farm animals.

* Fall due to severe attack of foot and mouth disease.

(b) The principal cause of injury to cattle from insufficiency of fodder is the difficulty in getting rid of surplus cattle owing to religious scruples. To assist in the supplies of fodders, Government has recently appointed a Fodder Specialist who is looking into the case of improvement of pastures, storing silage in time of plenty for use in times of scarcity, the stacking of dry fodder, &c. He is also investigating the possibilities of increasing the supplies of green fodders on irrigated areas in the months of April and May when it is usually most scarce; also in the months of November and December before *senji*, &c., is fit for use.

In *barani* areas there is little green fodder in dry seasons, and the Fodder Specialist is looking out for more drought resisting fodder plants, while the Deputy Directors' staffs are at work preaching improved methods of cultivation and conservation of moisture in such areas.

As stated in reply to Question No. 8 (a) (iii) it is proposed to have a large increase in the well boring staff of the department to augment water supplies in existing wells, and to bore new ones. Also *bunds* to catch rain water are being repaired in Gurgaon district, new *bunds* are being made, &c.

To assist in the supply of fodder during famine years it is also proposed to start a fodder farm of 6,000 acres in the Nili Bar.

The Agricultural Chemist is looking into the sufficiency and variations in the important mineral constituents of fodder crops grown in the widely different climatic soil and other conditions of the province. This work is being carried on as parts of the investigations on the nutritive values of these crops.

Dr. Lander, the present Chemist, is a specialist in work connected with food values in animal nutrition, and as far as the staff and facilities will allow he is beginning to open up investigations in that direction. The field is very important, wide and completely unexplored in the Punjab.

(c) In irrigated areas there is no great shortage of fodder but green fodder is most short from the middle of April to the end of May and in a lesser degree in the month of December. The same applies to *barani* areas in normal years, but in dry years the scarcity of fodders may be severe and may extend over any length of time. The failure of winter rains is as important as the failure of the monsoon rains owing to the fact that wheat *bhusa* which is such a valuable fodder all the year round is then short.

In *barani* areas the following fodders are available:—

Name of fodder.	Date of sowing.	Time when ready for use as fodder.
Wheat (*Triticum vulgare*).	Early October to end of November.	February and March as green fodder and the remainder of the year as dry fodder.
Oats (*Avena sativa*) ...	Ditto	Ditto. Scotch oats supply green fodder till the middle of May.
Barley (*Hordeum vulgare*).	Ditto	End of January to end of March as green fodder and remainder of year as bhusa.
Maize (*Zea Mays*) ...	March—April if winter rains are good.	Fed in 8 weeks time.
Chari (*Andropogon sorghum*).	April, May, June and July.	Fed green in 10 to 12 weeks time, chiefly fed green August, September and October and fed dry all the year round.

Name of fodder.	Date of sowing.	Time when ready for use as fodder.
Bajra (*Pennisetum typhoideum*).	July and August ...	Chiefly used for grain, and the dry stalks are fed to cattle. Ripe in 10 to 12 weeks time. Fed green in September and October and as dry fodder all the year round.
Gram (*Cicer arietinum*)	September and October	Green fodder in February and March; dry bhusa at any time.
Moth (*Phaseolus aconitifolius*).	June and July ...	Often sown with *jowar* and the mixture is known as *chara*. Fed green in September and October and dry in winter.
Gowara (*Cyamposis psoralioides*).	Sown end of May, June and July.	Fed green August, September and October.
Rape (*Brassica Campestris var. sarson*).	October and November in wheat and other crops.	Fed mixed with dry stuff in January and February.

(d) Government for many years has given concessions in the railway freights for transport of fodders to famine areas and has supplied fodders at cheap rates. As already stated, the well boring section is being largely augmented—*vide* reply to Question 8 (a) (iii); and a Fodder Specialist has been appointed to look into the question of improvement of pastures, fodder crops, siloing, &c.—*vide* reply to Question 16 (b) also there is the proposal to open a fodder farm to create reserve of fodders.

(e) Farmers already take a keen interest in anything that brings them profit. The main difficulty is that stock rearing does not pay as well as crop rearing does. In *barani* (rainfall) areas it is important to increase the certainty of fodder supplies and this is being tackled by Government in the manner shown above.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(a) Mr. Stewart, Professor of Agriculture, Punjab Agricultural College, Lyallpur, has looked closely into this matter on farms in the canal colonies for several years back. On the average of all his investigations he estimates that 17¼ days' labour of about eight hours each of one man and about nine days' labour of a pair of bullocks were expended per acre of land held. The common size of a holding in the canal colonies is half a square (about 14 acres). This holding would therefore necessitate about 241½ days of a man's labour and 126 days' labour of a pair of bullocks per annum. I understand, however, that Mr. Stewart's calculations represent the number of days of eight hours each occupied by a man and a pair of bullocks in actual cultivation operations and that no time has been allowed for the cultivator to feed his bullocks, guard his crop, repair his implements and water channels, his house and such like; also to make ropes, &c., needed for his farm. It seems to me therefore that the farmer would not have as much leisure time as the above figures would indicate, but Mr. Stewart will be able to explain the point. Farmers near *mandis* (markets) and towns sometimes hire themselves and their bullocks for carting work in the slack season; also they sometimes hire themselves for unskilled labour in towns. In the case of farmers on *chahi* lands (i.e. irrigated by wells) there is much less slack season than is the case with farmers on *barani* (rainfall watered) lands or canal irrigated lands.

In *bagani* districts, after the wheat sowings are over, a number of cultivators go to the canal areas and find work on repairing canals, roads, &c. In the south-eastern side of the province, harvests are earlier than in the canal areas, and in the case of the wheat harvest farmers of the south-east after harvesting their own areas, hurry off to the west to assist in harvesting operations there. The influx is chiefly to the canal areas.

Silk-rearing, basket-making, rope-making, &c., are done in some areas during the slack season.

(*b*) Fruit and vegetable growing, poultry keeping, silk rearing, lac cultivation, &c., could be greatly extended and improved.

Fruits. For many years now quite a number of fruit farms have been at work in the Punjab hills. Most of these were started by Europeans who no doubt found the climate of the hills more congenial than that of the plains. These farms are situated chiefly in the Kulu Valley and Simla Hills. Apples, pears, peaches and other fruit plants suitable for the climates concerned have been imported from various countries by the owners of the farms, and some excellent specimens of fruits now find their way into the Simla and other markets. This proves that excellent fruits can be grown, and farmed at a profit. Transport facilities however have hindered development in many cases. Fruits from the Kulu Valley for example have to be carried for over a hundred miles by road down through the Kangra Valley to the railway station at Pathankot, but in spite of this, there is quite a considerable trade of the more easily transportable fruits from that Valley.

In the plains of the Punjab there is a no less promising field for fruit farming. The kinds of fruits grown there differ from those grown in the hills owing to differences in the climatic and other conditions. For example the sub-montane regions are very suitable for such fruits as mangoes while the plains with their sub-tropical climate are very suitable for oranges, limes, lemons and other members of the Citrus family. Then there are such fruits as figs, plantains, pomegranates, plums, peaches, &c., common in various parts of the Province.

With the object of encouraging the development of fruit culture in the province, Government made the following grants of land:—

(1) In 1920, a grant of 722 acres of land at Renala Khurd (Montgomery District) for fruit growing; the special object being the development of the raisin industry.

(2) In 1921, a grant of 56 acres of land near Pakhowal, Gujrat district, in Chak No. 28 of the Upper Jhelum Canal, for general fruit cultivation.

(3) In 1922, a grant of 175 acres of land at Montgomery for general fruit cultivation.

Government has also set aside 500 acres of land in the Nili Bar for fruit culture.

In July, 1926, Government appointed a Fruit Specialist temporarily but as soon as it was known that a Fruit Specialist had been appointed there was an overwhelming demand from farmers in all parts of the Province for help and advice, and Government has given administrative approval for the inclusion of a post of a second Fruit Specialist in the next year's budget.

The season and crop report of 1925-26 shows that the area under orchard and garden produce in the Punjab is 287,000 acres and in view of the value of this produce to the health of the people as well as to the finances of the Province, the subject merits attention.

Previous to the employment of the Fruit Specialist, the Economic Botanist for the Province had to attend to work on all crops including fruits; but even with the very scant attention which we were able to give to date-

palm culture for example, we have been able to produce date fruits of a quality never before grown in the Province. These dates are in demand far beyond the confines of the Punjab at 8 annas per lb. packed in 1-lb. boxes while the date fruits grown near these sell at about Rs.2 to Rs.4 per maund (82⅔ lbs.). My opinion is that if skilled attention were directed to mangoes, figs, plantains, oranges, limes, pomegranates, peaches, plums and the numerous other fruits even now cultivated, much could be done to increase the profits got by fruit growers.

A very common complaint from growers is that nursery plants turn out to be of a different kind from that for which they were purchased and as this is only certain three or four years after the purchase, these growers suffer great loss. To help to meet the difficulty we are attempting to organize the private nurseries in the Province so as to give a guarantee that the stock sold from them will be as advertised; also we propose to establish small nurseries at each of our agricultural farms in the Province.

A railway is being constructed in the Kangra valley, and owing to better transport facilities fruit-growing will extend greatly there. The Kulu valley which lies beyond Kangra already grows a considerable quantity of fruits and this will also extend. I feel that the whole time of one fruit specialist could be profitably devoted to these two areas. We really need a large staff of fruit specialists and this will be asked for in due time.

As regards vegetable culture, the Economic Botanist was only able to touch potatoes in the Simla hills, but there again we have been able to increase the profits of farmers very substantially.

Government has set aside 50 acres of land at each of seven different centres in the Nili Bar Colony for vegetable growing, and it is intended to ask for a Vegetable Specialist in the year 1929-30.

Poultry. A Poultry Specialist has just been appointed. So far, this work has not been attended to for want of staff, but there seems to me a good deal of room for improving country fowls. I asked Mr. Harrop the newly appointed Poultry Expert to write a note for the Royal Commission and this has been forwarded separately through the Financial Commissioner, Development. Attached to it, are the Poultry Specialist's proposals for starting poultry work in the Punjab.

Sericulture.—There are records of sericulture having been tried in the Punjab as far back as 1836. It is also recorded that the industry was started in Kangra and Gurdaspur districts in the 'seventies of last century, but that it rapidly declined owing to pebrine disease, till in 1895 it was almost non-existent. In 1908 the Agriculture Department started to revive it. By this time the pebrine organism had been isolated and methods for its control had been worked out in France. Therefore, the main difficulty encountered in previous years had been removed.

In the first year of the work the Agricultural Department imported 26 ounces of pebrine free eggs—or seeds as they are commonly called, from France, and 23 ounces of these were distributed to various rearers in Gurdaspur. Two ounces were given to the Salvation Army to be reared at Changa Manga in Lahore District, one ounce was reared at Lyallpur.

The seeds were received in October, stored in Simla, and distributed to rearers in the beginning of February, so that they could be hatched out by the end of third week of that month when the mulberry trees burst into leaf. It takes about six weeks to rear the worms, and it was soon found that the temperatures in the plains are usually too high for successful rearing, i.e., they are too high before the worms can spin their cocoons. Hot dry winds had disastrous effects and it soon became evident that the sub-montane districts were the only promising field of operations. The department has, therefore, confined the silk rearing operations to Gurdaspur and other sub-montane districts.

Pebrine free seeds have been imported annually from France and elsewhere since 1908. In 1914 the amount of seed imported, and distributed, had risen to 600 ounces, and the quantity gradually increased till in 1922 it had reached 2,825 ounces. During these years people had discovered that they could get an income of Rs.40 to Rs.50 by rearing an ounce of seed which cost them less than Rs.3, and in their efforts to increase their income they began to buy amounts of seeds which produced far more worms than they could possibly accommodate or feed properly when they were near the cocoon spinning stage.

Rearing is mostly done by small cultivators and menials. The department by that time had discovered that the rearers required a good deal of instruction and guidance in order to get good results, and, as the staff of the department was small and greatly occupied with other work, it was thought advisable to reduce the quantity given to one family to what that family could reasonably be expected to rear; the consequence was that the seed imported in the following year was reduced to about 1,400 ounces. In the years 1924 and 1925 the seed imported amounted to 1,500 ounces per annum.

In 1921 the department obtained a temporary staff for mulberry plantation work, consisting of one Mulberry Superintendent and a few local gardeners. The Superintendent helped to supervise the rearing of the worms. Plantation work was started at Sujanpur on the banks of the Upper Bari Doab Canal, with a small plantation and a nursery for rearing young plants. This work has extended rapidly since then.

In 1925 a permanent sericultural staff was sanctioned consisting of two Sericultural Inspectors, four Sub-Inspectors, and six *mukaddams*. By that time there were about 20 plantations of mulberry trees covering a total area of 35 acres, scattered over a range of 45 miles; all the Plantations excepting one at Kot Naina in the Gurdaspur district being on the banks of the Upper Bari Doab Canal. The Irrigation Department has also placed old mulberry trees on both sides of the Canal and stretching over a length of 15 miles of its length, at the disposal of the Agricultural Department.

As regards the nursery work, about 15,000 mulberry seedlings are now being planted out each year on areas which the Irrigation Department has been able to provide, also many thousands of young mulberry seedlings are given to District Boards and private people who ask for them in order to start plantations.

Besides importing the silk seed, and arranging for its hibernation and distribution at the proper season, arrangements are made so that the rearers can have supplies of mulberry leaves either from roadside trees which are under District Boards or from trees on canal banks or from the department's own plantations. The cordial co-operation of the Irrigation Department in giving the use of their canal banks and plantations has been an important factor in the progress of the work.

The Agricultural Department holds silk cocoon exhibitions at the end of each rearing season and awards substantial prizes to the rearers who have got the best outturns of cocoons from unit quantities of seed, also prizes are given for quality. The department arranges auction sales of cocoons of the rearers who care to bring their produce to the sales. Difficulty has been experienced in the past two years in selling the crop as there are few buyers and these had formed a pool. Government, therefore, advanced money on the crop which the Agricultural Department stored and sold for the rearers at reasonable rates. The department also started a very small filature last year with the object of teaching the people how to reel their silk and so be independent of cocoon buyers. This also helped to dispose of the crop. Arrangements are now being made to start a filature at Shahdara on a much larger scale. This is an important step, as reeled silk is far more easily transported than cocoons, is almost indestructible and can be sent to buyers the world over. There is no doubt that the extension of silk rearing

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will be a great boon to a large number of the poorer classes of people in the Punjab, and now, with the provision of a small staff for this work, it should be considerably extended. It may also be mentioned that the rearing of silkworms has been introduced into quite a number of village schools where the children do the rearing under the guidance of the teachers. These schools are doing very good work, and this is proving an excellent means of spreading a knowledge of silkworm rearing among the rural classes. School teachers are also rendering assistance by guiding villagers in the rearing of silkworms. We hope to extend the work in suitable localities as early as possible.

Lac.—Lac is grown extensively in the Una Tahsil of Hoshiarpur District and in other places in the Province. The present income to growers of lac in Hoshiarpur District is about four lakhs of rupees per annum, and enquiries indicate that this can be increased to 20 lakhs of rupees or more if growers had a knowledge of methods of cultivation of lac, its pests, &c. Some experimental work has already been done, and an assistant is being trained to take it up later.

Bee-keeping.—This is practised to some extent by people in the hills and sub-montane tracts, and the subject seems worthy of further enquiry. This will be taken in hand as early as we can get the staff.

Other Industries.—The Director of Industries will have something to say re rope-making, basket-making, hosiery-making, &c.

(*c*) Localities may be climatically or otherwise unsuited for these industries. The most important obstacle in suitable localities is the peoples' want of knowledge of these industries. Government is attempting to supply this want by the appointment of the Experts already mentioned.

Another obstacle is that a number of these industries are looked upon by middle-class farmers as beneath their dignity. This we hope to overcome by propaganda.

(*d*) The subject of oil-pressing is being looked into by the Director of Industries; also the Agricultural Chemist to Government, Punjab, Lyallpur, has recently completed a month's tour visiting oil mills in India and enquiring into the possibilities of development of this industry in the Punjab. His report is not yet ready, but we hope it will be available before the Royal Commission comes to the Province.

As regards sugar making, I have already noted on page 111 that the Punjab Government has recently had Mr. Noel Deerr, a well-known sugar expert, for a month touring in the Punjab to investigate the possibilities of establishing modern sugar factories in place of the rudimentary uneconomic processes now in use in the Punjab, and that the case is under consideration.

There are about 350 cotton ginning factories in the Province, containing a total of 8,761 single roller gins, 156 double roller gins and 23 saw gins. This appears to be sufficient for the existing needs of the Province. These factories seem to spring up immediately, wherever they are wanted, and very often where there is no real need for them. I do not think there is any necessity for Government doing anything to encourage the establishment of these.

Small rice-hulling plants are now a common feature wherever rice is grown in the Province. I do not think there is any need for encouraging these either.

The use of cotton seed as fodder is well known in the Punjab, not only among farmers but amongst owners of stock in towns and elsewhere. Cardboard, paper and felt-making will probably be noted on by the Director of Industries.

In October, 1924, Government granted a lease of 385 acres of land on the Upper Chenab Canal in the Sheikhupura District, to Sardar Puran Singh for the purpose of growing raw material for the distillation of essential oils.

Sardar Puran Singh is a chemist of repute, and was lately Research Chemist in the Forest Research Institute at Dehra Dun. While there, he experimented on the possibility of extracting essential oils from indigenous plants and got interested in the possibilities of farming plants on a commercial scale. He has made a very good start with the land which he has now leased. A good deal of time had to be spent in clearing the area of jungle trees and bushes, in levelling and laying it out for cultivation, but he had over forty acres under *rosha* grass (*Andropogon shœnanthus*) last winter, and is extending that area as occasion permits. This is one of the principal grasses from which he hopes to extract essential oils. The crop is doing well. Two sets of distillation apparatus have been installed on the farm, and the extraction of oil has started. It is too early yet to make any remarks about the success or otherwise of this venture.

A large area of different kinds of oilseeds is grown in the Punjab, as will be seen from the figures given below:—

Area of oilseeds grown in the Punjab in the year 1924-25.

Linseed.	*Til.*	Castor seeds.	Rape (Sarson), *Taramira* mustard.	*Toria.*	Others.	Total.
Acres. 31,107	Acres. 109,242	Acres. 119	Acres. 657,200	Acres. 611,703	Acres. 27,370	Acres 1,436,741

A very large proportion of the crop is exported.

(*e*) Subsidiary employment will not be found for agricultural labourers if industrial concerns move to rural areas, as people prefer to work in industrial concerns, owing to the fact that they have regular hours and holidays, whereas on a farm their work is never done, night or day, Sunday or Saturday. If, therefore, labourers are employed in an industrial concern they will stick to it, and if they do not stick, then the industry will suffer if it is not a seasonal one.

(*h*) Popular lectures on public health and other methods of propaganda such as cinema shows, posters, &c., would be useful.

QUESTION 18.—(*a*) AGRICULTURAL LABOUR.—(i) I have not heard any complaints of serious shortage of labour in the Punjab.

(*ii*) Uncultivated land is usually found where cultivation is insecure or the land is so unproductive that it cannot bear the cost of cultivation and leave a profit. The making of canals and the sinking of wells where these are needed would attract agricultural labour. This is already being attended to by the Punjab Government.

(*b*) Kindly see reply to (*a*) above.

(*c*) Irrigation by canals and wells, the draining of water-logged areas, reclamation of *bara* lands, &c., would assist. These are already receiving the attention of Government.

QUESTION 20.—MARKETING.—(*a*) The following is a general note on the present system of disposal of agricultural produce:—

As regards the present system of disposal of agricultural produce in different areas of the Province, and the extent to which the full market price is realised by the producer it is realised that the department is sadly lacking in data in this important subject. Here again the services of the Professor of Economics and staff are needed. The following is, however, a rough indication of the situation:—

In the south-east of the Punjab where crops are not too certain, and transport and communications are not very good, the village *banias* (shopkeepers

who lend money) receive practically all the produce from the farmers in their neighbourhood and sell it in the markets. In most cases the village *bania* gives to these farmers advances in cash, seeds and necessaries of life, and he is repaid for this in the form of crop produce at harvest time. The same applies to the *barani* (rainfall) districts of the north-west. Even in the central districts where communications are good and the crops are more secure, practically the same system prevails. In the canal colonies, where there is a considerable surplus of agricultural produce for sale, the communications are good, and the crops are very secure, a good deal of produce is taken to the *mandis* (markets) direct by farmers and sold usually through commission agents. The zamindar is illiterate and obviously is much at the mercy of the small traders. Within the past twenty years certain improvements have taken place in marketing of farm produce. In wheats, for example, the basis on which purchases are now made by the grain trade are on an entirely different footing.

In the old days the basis used to be—

Red wheat, 7 per cent. barley, 3 per cent. dirt.

White Karachi, 5 per cent. barley, 3 per cent. dirt.

Delhi choice white (which was the best quality in the Province), 2½ per cent. barley, 2½ per cent. dirt.

In those days wheat consignments were expected to contain these amounts of barley and dirt, and if they did not originally do so, people interested mixed them with barley and dirt up to or above these amounts, as it made comparatively little difference to the price obtained. In those days, therefore, it paid dealers to put as much dirt into Indian wheats as possible, and consequently Indian wheats were notoriously dirty.

The present basis on which wheats are sold in the Province is 2 per cent. barley and 1¼ per cent. dirt for all wheats up country (i.e., away from the port of Karachi), but traces of the old system are still to be seen in Karachi, where all local business is yet done on a basis of 5 per cent. barley and 3 per cent. dirt.

The selling basis for wheats in England is now 2 per cent. barley and no dirt. In the case of consignments which contain up to 1 per cent. of dirt, buyers make deductions for dirt at the rate of the price of wheat. For any dirt over 1 per cent. deductions are made at double the contract rates. Similarly deductions are now made for excessive mixtures of barley in wheats; therefore it does not now pay dealers to put dirt into these wheats. The effect of the new basis is, it is stated, most noticeable in the Punjab. Wheat is now marketed here with much less barley, it being now possible to get Punjab wheats in large quantity containing on an average less barley than the old Delhi choice white which has degenerated, also dirt is now well under 3 per cent., whereas it was formerly over 5 per cent. The saving in freight and in the cost of cleaning out this extra dirt, &c., is considerable, and must reflect to the farmer's advantage in the way of an increased price which the buyer is able to pay for the cleaner grain while still retaining to himself all the profit which competition will allow. There is, however, a tendency in certain districts to water consignments of wheats. This is found, for example, in some parts of the canal colonies.

Again consignments of wheats can now be got much more true to a type than was the case formerly. This is due to the work of the Agricultural Department in sending out pure types of seeds to growers which are replacing the old mixed types grown. There is, however, still a necessity for grading wheat, and it seems desirable that some system of grading should be introduced.

Other grains are now also sold on a basis of purity and quality.

In the years 1906 and 1907 when, on the advice of the Inspector-General of Agriculture, the Punjab Agricultural Department was attempting to introduce acclimatised American cotton from Dharwar in the Bombay Presidency

arrangements were made with certain firms to buy the *kapas* (unginned cotton) at a premium of Re.1-8-0 per maund (82 lbs.) over the price of *desis*. This was not satisfactory, however, and in 1908 Mr. Milligan inaugurated a system of auction sales for the *kapas* to assist farmers to get the proper market value for their cottons. The sales were held on certain prearranged dates at specified places fixed after consultation with the farmers concerned. Arrangements were also made that suitable quantities of *kapas* should be brought to those places on those dates, and that intending buyers should be present. At these sales the *kapas* was roughly graded by the agricultural staff. This system of sale usually brought a premium over the ordinary market price for such *kapas* on the same date. It had its drawbacks, however, in that if a farmer brought his *kapas* to the auction on the date selected, and the market price happened to be low, there was a certain amount of dissatisfaction, for although the farmers had agreed to bring a certain quantity of their *kapas* to the sale on that date they were apt to think that if they had been left to market their produce on any date they wished to do so they might not have chosen a date when the price was so low; if, on the other hand, the market happened to be comparatively high on the auction day everybody was perfectly happy. In view of these drawbacks, therefore, it was thought advisable to discontinue these cotton auction sales as soon as a market for this quality of *kapas* was firmly established. The same system of auction sales has been adopted on the introduction of 4-F and other new types of both American and *deshi* varieties.

Further, to assist farmers to get fair market prices for their cottons, a system of telegraphing Bombay cotton prices to the principal markets in the Canal colonies was started by the Agricultural Department in 1917. Government bore all the connected expenses (about Rs.20 per mensem per market) till 1925, when the Provincial Cotton Committee resolved that the local bodies concerned should be advised to subscribe to the Agricultural Department the cost of these telegrams. District Boards concerned were accordingly addressed, and with the exception of Gujrat, Shahpur and Lahore, all are now paying the cost of the telegrams sent to them.

Experience indicates that the system benefits farmers, and it will be continued. Government is also considering the amendment of the Punjab Municipal Act so as to provide for power to prescribe standard weighing appliances and possibly to regulate market dues.

The Punjab Provincial Cotton Committee referred to above was formed in 1922 on the recommendations of the Indian Cotton Committee of 1918. It consists of about a dozen members, including Deputy Directors of Agriculture, prominent private growers, ginners and traders, with the Director of Agriculture as President, and interests itself in all matters connected with cotton growing and trading.

Very soon after the introduction of 4-F American cotton it was discovered that *deshi* and 4-F could be mixed to a very large extent without buyers being able to detect it. This mixing is undoubtedly done mostly after the produce leaves the hands of the farmers. Some mixing is done by the village shopkeeper, but in the *kapas* stage the mixing can be detected by the presence of the *deshi* seeds, as these differ markedly from the seeds of American types. Most of the mixing is done during the ginning process as an intimate mixture almost impossible to estimate can be made at that time at practically no extra cost.

In cases where American cotton is sold forward in a year when the variation in prices is great, the temptation to mix these cottons is very great, the loser in the transaction often being able to minimise his loss by resorting to this practice.

The mixing of American types of cottons with *deshis* has a considerable influence on the spinning quality of the consignment and the measure

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of that influence can only be detected with accuracy when the consignment is put through the spinning mill.

Under the present system of marketing, therefore, cottons are purchased largely on the reputation of previous consignments and as middlemen cannot offer more for cottons than they get from the spinner the result of the mixing is that prices are lowered and the difference comes out of the farmer's pockets. To mitigate this evil the Indian Central Cotton Committee put forward the Cotton Pressing and Ginning Factories Act which came into force in 1925. The Act provides for the maintenance of registers containing daily records of the amounts of cotton ginned, and the number of bales pressed in each factory; the identification of the factory concerned, a record of the names of the persons for whom the cotton was ginned or pressed, the marking of bales, the submission of returns to a prescribed authority on prescribed dates, the use of correct scales and weights in the factory, the construction of gin houses in accordance with plans and specifications approved by the prescribed authority, &c. The Act will enable bales to be traced back to the persons who ginned and baled them, and it is hoped that it will be of assistance in checking the practice of mixing and adulteration. Growers of American cotton have already lost much owing to the practice of mixing. If this does not stop, there will be little or no incentive for farmers to grow better staples and the result may be disastrous. The present slump in the premium of American varieties is partly due to the general fall in price of cotton, but is also due to an appreciable extent to the loss of confidence by the trade in the quality of Punjab cotton delivered at the spinning mills owing to the wholesale mixing with *deshi* cottons which has taken place so commonly in the Province in past years.

In my opinion the real remedy is to sell cotton on a certificate of quality as many commodities now are. A suggestion on this point has been discussed by the Provincial Cotton Committee and the Indian Central Cotton Committee at Bombay, but the latter Committee considers that there are great difficulties in the way of working this system. It certainly means nothing less than a revolution in the system of cotton trading, but the Director of Agriculture feels that the difficulties are greatly magnified and that they will have to be faced sooner or later if the farmer is to get a fair price for his cotton and fair inducement to grow a better quality. This system of selling cottons would undoubtedly give cotton growing a greater stimulus than anything that has ever yet been done. An endeavour to find ways and means to give it a trial on a small scale in the Punjab is being made. In every village there are facilities of some sort for marketing, if nothing more than the shop of the *bania* (a shopkeeper who lends money and supplies various kinds of goods, including the ordinary necessaries of life to his customers). In small towns there are numbers of such shops. There are also regular *mandis* (markets) scattered throughout the Province, but the market charges are fixed by the traders concerned; the farmer has no voice in their management. In the canal colonies most cultivators have to carry their produce twenty miles or less to a *mandi*, but outside these colonies regular mandis are much more scarce.

Even the markets in the canal colonies are not satisfactory, however, and transport communications are often not good, but Government has in hand an extensive programme for improving roads and for extending the railways in the Province.

(*b*) I think the system of marketing is very unsatisfactory.

The farmer has the following ways of disposing of his produce:—

(1) He may sell his produce to the village *bania*.

(2) He may sell to a peripatetic dealer or to the representative of a firm sent out to the village to buy produce.

(3) He may take his produce direct to the mandi and sell it through a commission agent (*arti*).

(4) In the case of cotton he may sell direct to the ginning factory, and in the case of wheat he may meet a broker (*dalal*) of a firm who will bring him to a buyer.

(5) Co-operative commission shops are now being established, the members of which are farmers who sell their produce through this agency. Private co-operative associations are arising, such as the one established at Bahlwal (Shahpur district) which deals in all farm produce.

Regarding services rendered, the farmer usually has an account with the village *bania* who generally supplies him with the necessaries of life throughout the year. Like everybody else the bania buys the produce as cheaply as he can and usually a good deal below market price. Usually the cultivator is not in close touch with market conditions and is much at the mercy of the *bania*, or any other dealer; but the farmer prefers to sell his produce in the village as he avoids many of the difficulties which he meets with in distant markets. For example, he avoids having to wait for a buyer and the trouble of taking his produce many miles back to his home again if he meets with unfavourable offers; having to wait for payments; the trouble of arranging for accommodation for his cattle while they are away from home, &c., &c.

The *bania* transports the produce to the *mandi* and sells it through a commission agent (*arti*) there.

The commission agent takes delivery of the produce from the farmer, stores it, arranges for the sale, does any work of bagging, stacking, weighing, collecting money, &c., &c. The charges vary in the various markets, but may be taken as Rs.1-9-0 to Rs.1-12-0 per cent. In addition there are many payments in kind to be made by the seller including deductions for charities, the water man, cook and servants of the commission agent, for covering loss in dryage, for samples of the produce, &c. All this brings the direct expenses of the seller up to something like Rs.2-8-0 to Rs.3-8-0, or even as high as Rs.4 per cent. The commission agent also charges from the buyer Rs.0-4-0 to Rs.1 for brokerage and any other services he may render If the produce is not sold immediately the commission agent may advance part of the price of the produce to the farmer, for which he charges interest. This may be at the rate of about annas 12 per cent. per month.

The total charges made in different markets in the canal colonies vary enormously and there seems no great reason for this.

The farmer complains that when he goes to the market with cotton, for example, and has made a bargain, the buyer sometimes objects to the quality of the kapas when most of it has been unloaded; the excuse made being that it is not of as good quality at the bottom of the cart as on the top of the cart. The farmer cannot easily reload his cotton and usually has to take a lower price. Complaints are also made of incorrect weighments, &c. Practically no barter takes place in the markets in this Province.

I have sent separately copies of information* collected at my request by various departmental officers in connection with letter No. 571-14, dated 19th August, 1926, from the Liaison Officer between the Royal Commission of Agriculture and the Government of India. In my opinion intensive enquiries are needed into the conditions of marketing in typical markets.

*Not printed.

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and in this connection I may state that the Indian Central Cotton Committee has agreed to finance an intensive enquiry into cotton financing and marketing in the Punjab. The enquiry will last from 1st of September 1927, to the end of February, 1928. Also the Board of Economic Inquiry, Punjab, has under consideration a proposal to start an enquiry into the marketing of agricultural produce in the Province, and a sub-committee has been appointed to consider the case. I hope we will get this enquiry started in the coming summer. This I think will throw considerable light on the marketing question here.

For several years back, the Lyallpur market has been admittedly far too small for the extensive business in farm produce conducted there; also complaints have been heard from time to time from farmers that weighments of produce there are unfair, that middlemen are exacting unfair allowances, that there are no facilities for farmers to store their produce, &c.

The Punjab Government has had the question of improving this market under consideration for some time and has decided to start a new market on another site which has been fixed.

The Indian Central Cotton Committee suggested that open cotton markets on the Berar system should be introduced in the canal colonies, and this proposal was considered by the Punjab Provincial Cotton Committee; also later by the Punjab Government. The views of the Committee were that separate cotton markets were not suitable for the canal colonies. In these colonies cotton, wheat and oilseeds are the main commodities and are sold in the same market. These markets are generally enclosed by buildings composed of the shops, houses, etc., of the dealers and commission agents concerned. These dealers and commission agents pay high prices for their sites and carry a continuous business over a large part of the year in cotton, wheat and oilseeds; but if markets were opened for cotton only, they would be idle for the greater part of the year.

After a good deal of consideration Government decided to amend the Municipal Act in order to introduce standard weights and measures. This will be an improvement, but there is nothing to prevent uncontrolled markets being established just beyond Municipal limits, and I am personally of opinion that we must aim at introducing, as early as possible, a Bill for the regulation of the sale of the main commodities in general markets which will provide for representation of farmers on the market committee, and will have a sphere of action which can be extended beyond the limits of Municipal areas.

At present the *mandi* charges are controlled in practically all *mandis* by a panchayat of dealers, and I have no doubt that these men will strongly object to this proposal; but I feel that farmers will never get fair markets for their produce until they have a voice in their management; including regularising of the commission which they have to pay to dealers, the deductions to be made for charities and other dues.

To provide for the establishment and the better regulation of cotton markets in the Bombay Presidency, a Bill has been drafted on the recommendation of the Indian Central Cotton Committee and has now been published in the *Bombay Government Gazette* prior to introduction in the Legislative Council. This Bill is on the lines of what I would suggest for the Punjab; but we want one for general markets here.

(c) As regards wheat much was done by narrowing the selling basis on such points as the margins for dirt and impurity (*vide* page 215). The Agricultural Department has also done a good deal to raise the quality

and purity of wheats by displacing the original mixtures of types grown, by pure types of wheat such as Punjab 11 and 8-A which now cover a total area of over a million acres (*vide* page 107). These wheats are spreading rapidly, and it is now possible to get large commercial consignments of one pure type. It has been shown by the results of milling tests which I have carried out in the Punjab that on account of the more accurate conditioning which can be done when preparing the wheat for grinding, the miller can get more out of a pure type of wheat than out of the mixtures previously found in the markets.

The North-Western Railway have recently had an officer on special duty enquiring into the possibilities of instituting a system of grain elevators in the Punjab. A complete scheme must be worked out as the success of the elevators will depend on whether grain can be cleaned, stored and graded in them at a cost which will give results that will compete with the present method of marketing. Also the system will have to be suitable for trade in the country as well as for export as the latter fluctuates so excessively.

As regards cottons the Agricultural Department has already introduced over a million acres of pure types which have replaced the mixtures previously grown in the Punjab (*vide* page 198). Unfortunately mixing of *deshi* and American cottons has been rife for a number of years back and this has caused great loss to farmers by adversely affecting the reputation which Punjab cotton had in the world's markets.

Investigations have shown that American cottons growing in the fields usually do not have more than 5 to 7 per cent. mixtures of *deshi* in them; that 10 per cent. is less common, and that they are very often practically pure. On the other hand, cottons when leaving the ginning factories frequently have 25 per cent. *deshi* mixtures, and are sometimes mixed with *deshis* to the extent of 30 to 40 per cent. A point of interest in this connection is the information I have received that the lots sent to Bombay from certain markets were more or less pure, while the lots sent abroad were much more mixed. It seems to me that the reason of this is that the Bombay mill owners have a close enough connection with the Punjab to know what qualities of cottons are grown here and to take measures to get consignments of something like those qualities, whereas people in countries outside India are having the highly adulterated Punjab American cottons palmed off on them as the sort of thing actually grown in the Punjab. The most serious aspect of the situation is that if the reduction in prices of American comes to a point at which it no longer pays the farmer to give the extra water and attention which the American crop requires these high-class cottons will cease to be grown and Punjab farmers will lose the extra profits which they have pocketed in the past. There is an obvious need for the qualities, quantities and purities of the cottons grown in the Punjab to be better known in wider cotton markets, and steps are being taken to effect this. The situation is helped by the fact that the Cotton Ginning and Pressing Factories Act which came into operation on 8th August, 1925, assists in checking mixing, as it enables bales to be traced back to the persons who ginned and baled them; but in my opinion the mixing evil will never be eradicated till the testing-house system referred to on page 128 of the memorandum is in operation. In this connection I am glad to hear from the Director of Industries that a Government cotton-spinning mill is to be started at Shahdara, near Lahore, in the next couple of years or so where in collaboration with him important tests may be made. If cottons could be sold on a basis of quality instead of largely on reputation as at present, grading would immediately be started by farmers and dealers in order to get better prices, and we would turn

that greatest of all driving forces, *self-interest*, into helping us to improve the qualities of cotton grown, instead of hindering us as at present.

(*d*) Telegrams giving cotton prices in Bombay are posted in the more important cotton markets in the Punjab three times per week from about 1st November to end of February. District Boards or Municipalities concerned pay for these telegrams.

If the Bill for the regulation of markets above suggested were in operation it would be the duty of the committee of growers and traders managing a market to collect this and other information and make it available to all in the market.

QUESTION 22.—CO-OPERATION.—(*a*) I think propaganda, including lectures, lantern slides, cinema films, etc., making known the benefits of co-operation, is of great importance. This the Co-operative Department has taken up vigorously.

(*b*) (i) These confer great benefits on the agricultural community in that they provide credit at reasonable rates and ensure fairness in dealings. They encourage thrift and punctuality in repayment of loans; are an influence tending to check the borrowing of money for unproductive purposes, &c.

(ii) Purchase and sale societies ought to be useful, for example, in the purchasing of ordinary necessaries of life and other requisites in demand in the community. There will be difficulties in providing the skill to buy commodities as economically as will please the members, and also in getting people to purchase from the society when the rates are less favourable than they are in other places, &c., &c., but I think work on this line should be persevered in.

(iii) Societies for the sale of produce would be useful and ought to do well. In the case of cotton, for example, the society could arrange for grading the *kapas*, as the Agricultural Department did in the case of cotton auctions. The results of this would be that the produce will be worth more in the market. These societies can also ensure fair weighments and save the farmer from having to pay unnecessary and unfair allowances which are said to be all too common in the ordinary *mandis*. The case is similar with wheats, oilseeds, &c. Again, there seems to be an opening for a sale society for the grading and marketing of fruits, vegetables, eggs and other perishable farm produce.

(vii) I think it is a little early for these yet, but they can be tried.

(viii) I am not very hopeful of cattle breeding and cattle insurance societies, as cattle breeding is not paying enough.

(ix) Better farming societies have just been formed, and it is yet early to say much about them; but I think there is a future for them, as it has been shown conclusively that profits can be greatly increased by better farming.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*a*) I think that propaganda in the form of lectures, lantern views, cinema films, &c., would do a good deal in this direction.

(*b*) The Board of Economics in the Punjab, which is a non-official body and is composed of officials and non-officials, does very good work in this connection.

QUESTION 26.—STATISTICS.—(*a*) (i) The areas of crops are recorded before each harvest by *patwaris* (village accountants) and are accurate enough for all practical purposes.

(ii) In the Punjab, forecasts of areas and yields are published for the following crops:—

(1) cotton;
(2) wheat;
(3) sugarcane;
(4) *rabi* oil seeds (rape, *toria*, *taramira*, mustard) and linseed;
(5) sesamum; and
(6) indigo.

Yield figures are given in Statement V of the Season and Crop Report for the following crops:—

(1) cotton;
(2) wheat;
(3) sugarcane;
(4) *rabi* oilseeds excluding linseeds;
(5) rice;
(6) *jowar;*
(7) *bajra;*
(8) maize;
(9) barley; and
(10) gram.

Also areas and outturn figures for tea are collected and sent separately to the Director-General, Commercial Intelligence.

In Statement III of the Season and Crop Report, the areas but not the yields of many other crops are given.

Crop forecasts, including estimates of areas and yields are published by the Director of Agriculture. For this purpose he receives information from the Revenue authorities and from this District Agricultural Staff on which he bases his estimates.

In the case of the Revenue authorities the field *kanungo*—a revenue official who supervises the *patwaris*—submits to the Tahsildar an estimate of yield after consultation with farmers and his *patwaris*. The Tahsildar frames his own estimates for the whole tahsil, based on the reports from his different *kanungos* and on his own observations and consultations with farmers. The Tahsildar in turn sends his estimates to the Deputy Commissioner's Office, where the Revenue Assistant frames his own estimates from his own observations and from figures given by Tahsildars.

The Director of Agriculture then compares these district estimates with other estimates which he receives from the agricultural staff who are working in the district, and with the other information which he receives, and frames his forecasts, which are published.

The Director of Agriculture is also assisted in his estimates by a standard yield for each district which is fixed quinquennially. In fixing the standard, the yields fixed in the previous returns, or for assessment purposes, together with the results of the crop cutting experiments made annually and during assessments are considered along with the opinions of local officers of the Revenue and Agricultural Departments.

A statement showing the number of crop cutting experiments conducted annually is attached.

In the case of cotton, the Director of Agriculture is now further assisted by the weekly returns received under the Cotton Ginning and Pressing

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Factories Act of 1925, which show what amounts of cotton are baled each week in each pressing factory in the Province.

With the increase in the number of Agricultural Assistants at work in districts, the number of observers is increasing, and as these carry out crop-cutting experiments, the number of crop-cutting experiments is increasing. In my opinion the increase in the number of crop-cutting experiments (*i.e.*, harvesting of experimental areas under proper supervision) is of the greatest importance to increasing the accuracy of our estimates of yield. To my mind we conduct far too few of these experiments at present, but the numbers are limited by the staff available.

For such crop as wheat and barley a motor harvester could, I think, be evolved which could go into farmers' fields and cut and probably thresh the crop as it goes along. With such a machine thousands of crop-cutting experiments could be done in a season, and the result would be of the very greatest value in the case of the crops mentioned above; but a machine has to be evolved as there is nothing suitable on the market for this purpose, and so far we have not been able to tackle the subject of evolving one. With the increased staff in the Engineering Workshop at Lyallpur, however, we hope that some attention will be given to it in the near future.

(iii) This is done by the Director of Land Records, Punjab, who can give all information.

(iv) This is dealt with by the Revenue Department, who can give the information.

(v) The recent spell of dry weather which this Province has had, together with the anxious enquiries which we are receiving from firms as to where and how much rain has fallen, impresses upon me the necessity for more information being made available to the public re the amounts of rainfall in every *tehsil* of the Province. The Director of Land Records already receives weekly information of the rainfalls in each *tehsil* in the Province, but it seems necessary to get the information at least twice a week and to make it known in detail to the public.

(*b*) I would strongly recommend that the publication of the Inland Trade Returns which were stopped in 1922 be restarted with all speed. They provided for many crops a valuable means of checking the estimates of production. Taken together with statistics of areas and yields of crops, they gave an indication of food supplies in the country which is essential when food grains have to be controlled, as was the case with wheat here during the Great War. These Inland Trade Returns are also essential for the study of the economic progress of India.

Statement showing expenditure on Agriculture, including Veterinary, for the year 1906-07 to 1926-27

Year.	Budget of Director of Agriculture, Punjab.			Budget of P.W.D.	Grand Total.
	Agriculture.	Veterinary.	Total.	Major and Minor Works, Agriculture and Veterinary.	
	Rs.	Rs.	Rs.	Rs.	Rs.
1906-07	96,710	3,63,210	4,59,920	1,61,782	6,21,702
1907-08	1,35,635	3,45,520	4,81,155	1,81,398	6,62,553
1908-09	1,80,248	3,12,826	4,93,074	60,367	5,53,441
1909-10	2,14,227	3,24,077	5,38,304	87,400	6,25,704
1910-11	2,26,614	3,18,421	5,45,035	65,419	6,10,454
1911-12	2,46,546	3,33,897	5,80,443	53,378	6,33,821
1912-13	2,72,416	5,16,304	7,88,720	70,913	8,59,633
1913-14	3,71,552	5,54,035	9,25,587	4,44,153	13,69,740
1914-15	5,18,156	5,63,279	10,81,435	4,16,936	14,98,371
1915-16	5,20,506	6,29,617	11,50,123	1,69,070	13,19,193
1916-17	5,75,634	5,86,351	11,61,985	1,29,840	12,91,825
1917-18	7,52,382	5,14,230	12,66,612	72,234	13,38,846
1918-19	10,09,617	5,60,190	15,69,807	1,05,139	16,74,946
1919-20	12,59,024	6,86,904	19,45,928	1,11,688	20,57,616
1920-21	14,54,454	8,88,231	23,42,685	3,31,858	26,74,543
1921-22	16,36,010	10,47,893	26,83,904	2,86,768	29,70,672
1922-23	14,84,105	9,69,414	24,53,519	1,35,270	25,88,796
1923-24	13,25,635	8,65,033	21,90,648	77,886	22,68,554
1924-25	14,03,169	9,02,557	23,05,726	77,337	23,83,063
1925-26	18,08,980	12,06,438	30,15,418	1,90,224	32,05,642
1926-27	24,49,600	11,55,600	36,05,200	10,22,200	46,27,400

NOTE.—Figures of actual expenditure for the year 1926-27 being not available, budget figures have been given.

Oral Evidence.

41,435. *The Chairman*: Mr. Milne, you are Director of Agriculture in the Punjab?—Yes.

41,436. You have provided us with a note of the evidence you wish to give; do you wish to add anything further to that at this stage?—No.

41,437. Would you give us, quite shortly, an account of your own training and past appointments?—I took a B.Sc. degree in agriculture in Aberdeen; I did a little extra work in bacteriology and chemistry; I got a scholarship to study bacteriology at Copenhagen, which I never really started work on; I had held it a week when I was offered an appointment on a big land reclamation scheme in Egypt. I had to take my choice, and I went out to Egypt, and stayed there for two years, from 1905 to 1907. The water supply for that scheme failed. There was plenty of land but too little water, and I came to the conclusion that it could not be a success; as a matter of fact, the scheme has since then become a complete failure; I went home to London and got

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an appointment as Economic Botanist in the Punjab in 1907; since then I have been here.

41,438. How long have you been in your present office?—Since 1923. I officiated once or twice before.

41,439. Your note of evidence as printed and before the Commission makes reference in more places than one to the provincial memorandum; we are accustomed to make public the notes of evidence presented, but not the provincial memorandum, and we propose also to publish the note of your evidence as part of your evidence, when the proceedings are published. Perhaps you would look through the various references to the provincial memorandum which occur in your note and let us know whether we might embody the extracts referred to in your note for publication?—Yes.

41,440. Would you tell the Commission whether you think the arrangements which you have in this Province for making and preserving records of the department are satisfactory. For instance, are records of the experiments that are made, including those that fail as well as those that succeed, being put together so as to be readily available for you, and, more important still, for your successors?—That sort of thing is published in what we call Part 2 of the Annual Report, in which every officer is allowed to put down the details of any experiment he carries out, and I think most things will be found there. I have no doubt that as time goes on we shall be able to improve a good deal on what has been done, but there you will find the work that has been done in the department, fairly fully depicted.

41,441. You are yourself satisfied that enough pains are being taken accurately to record experience as you go along?—Yes, I think we are doing all we can; we shall improve with time no doubt.

41,442. I want to get from you in evidence a statement of your existing cadre and its disposition through the Province. Is the table shown on pages 138 and 139 to date. It shows the Province divided into five Circles?—Yes. we are about to open another Circle in Rawalpindi. As a matter of fact, the order has just been passed, and the opening will take place now; but the men have not moved yet.

41,443. What is the grade of officer in charge of each Circle?—An Indian Agricultural Service officer.

41,444. Holding what rank?—Deputy Director.

41,445. The subordinate staff in each Circle depends, I suppose, upon the stations situated in that Circle?—Quite.

41,446. Then for the future you have favoured us with two draft programmes of expansion during the period of the next five years.* How far are these programmes accepted? Is the matter still under consideration?—We have got the first year's instalment; the second is going before the Council at this sitting. The programme signed by Mr. Emerson is the one we are working on.

41,447. Is that finally accepted?—I do not know that one can say it is accepted, because, after all, it depends on the vote of the Council. The Council will vote upon the instalment for each year as it comes. It is rather hard to say at this stage whether it will be all accepted.

41,448. It is rather a guide as to your own ideas as to what should be done, for your own purposes?—Yes.

41,449. Has it been presented as a five-years' programme to the legislature?—No; I have no doubt that the individual members have seen it, but not the legislature as such.

* Not printed.

Mr. Barron: It is in the shape of a note which the Government will consider.

The Chairman: I am really seeking guidance as to whether it would be proper for me or any of my colleagues, all of whom have seen the document, to refer to particular paragraphs.

Mr. Barron: I think so.

Mr. Kamat: Were you anxious to have a guarantee that it should be a five-years' programme?—Yes, I should like it to go through; the first year has gone through the Council, and we are acting on that; the second year is in the Budget now before the Legislative Council. It has been passed by the Standing Finance Committee and everybody else.

The Chairman: But it is a fact that the Council itself has not had the programme presented as a five-years' programme?—No. It has not been presented as a whole.

Mr. Barron: No; the question of finance arises.

41,450. *The Chairman*: Do you think the Council would be disinclined to commit itself to a five-years' programme; is that the idea?—Yes, I think it is rather difficult for any particular Session of Council to say.

41,451. Do you mean to bind its successor?—Of course, the same people will be in now till the end of that time.

41,452. Would it be a great advantage to you to know that you had your five-years' programme assured?—Yes, I think it would be much more satisfactory to us.

41,453. Does the second of these programmes, so far as it deals with the first year of the five, represent an accurate statement of what has already been approved?—Yes, we are absolutely up to date with that; I mean, as far as the Council is concerned, it is passed. We have difficulty in getting some of the men, buying land for farms and so on, but as far as the Council is concerned, they have given us all support.

41,454. I think it would be a great help to the Commission if, during the period from now till the Commission reports, you could let us hear if any substantial changes are made?—Yes.

41,455. Because we shall be rather depending upon this as being, broadly speaking, an accurate statement of what is likely to be accepted as the five-years' programme. Can you tell us now what you consider the financial requirements for the whole five years would be?—I can tell you more or less; it would be (*a*) non-recurring over Rs.72,00,000, and (*b*) recurring Rs.20,59,000.

41,456. That is at the end of five years?—Yes, provided that we do not have to go into the question of the *tehsil* farms, which will probably raise this non-recurring expenditure by 11 lakhs and the recurring by Rs.74,000, or something like that. At the present moment we are trying better farming societies to see how far we can make use of those to help us with work in the districts and save us from having to put down *tehsil* farms in large numbers.

41,457. Have you worked out the problem of training the staff required to carry out this programme?—That is one of our very great difficulties; that is one of the things in regard to which it would help us very greatly if we could get the Council to pass this programme as a whole, as it is not easy to get permission to engage staff for something which has not been passed by the Council, and there is no doubt whatever that men require some years' training before they can be put into a responsible position on a farm or anywhere else. If we have got to wait for the Council to pass each item, and then think about recruiting the staff, it

will take us another six months probably before we can get anybody, and then perhaps a year and a half or two years before we can put a young man into a responsible position. That means delaying things a great deal. That is one of the great advantages we should have if we knew we were going to have this programme passed as a whole. In that case we might then be able to get staff ahead a year and a half or two years, and have them trained and ready to take up their positions. We are particularly hard up at the present moment for trained staff. We are expanding at a very great rate, and we find that every man with any experience at all is called upon to fill half a dozen places while he can only fill one; that is the real trouble.

41,458. If you have to depend on your budget to be passed from year to year, do you think you will be able to increase your cadre without sacrificing efficiency? Do you think you will be able to get the extra men and maintain the same degree of efficiency?—If we put raw men into positions of trust we cannot expect them to do as well as men who have been under the hand of some responsible person for a couple of years, and have then been sent out to take charge independently.

41,459. Do you think the five-year programme as presented to the Commission is within your capacity?—I do not see why it should not be. Of course there is a certain difficulty in getting men with proper qualifications and so on. I am keen to maintain a fairly high level of salary for the men. If we offer small salaries we may rope into the service one or two men who have already had an agricultural education, as they must after all get something to live on, but I feel that if the salaries offered are small we will not attract the best brains of India into the Agricultural Service, and in ten years' time we will have very few men competing for these posts. That is one of the reasons why I think that we should get the old I.A.S. salary for the men we are getting into the new service which is about to be created. I feel that if we give a good salary people will compete to get into the service, and in ten years' time we will have a number of men to select from.

41,460. *Sir Henry Lawrence*: What rate of salary are you referring to?—Rs.350 exclusive of over-seas allowance, rising to Rs.1,250, then selection grades.

41,461. *The Chairman*: Is there any prospect of your going outside the Province for men to fill any of these posts?—I do not know.

41,462. Provincial patriotism, I suppose, runs high?—Yes, and provided we give good salaries I feel sure that there are men of ability who could come in; but if we make the salaries very small, then capable young people in the Punjab will not come in, and we will not get men properly qualified for the posts.

41,463. Now a word or two on Question 1 in the Questionnaire, on Research. You make a reference in several places in your note to Research, and the provincial memorandum also refers to this question. What is your view of the principle embodied in the Indian Central Cotton Committee?—The Indian Central Cotton Committee has done extraordinarily good work, and I think there are several outstanding reasons for it. One is that they have got money in their hands from the cess on cotton. If they like a scheme and decide to push it they can say, "Here is the money with which to carry it out." Secondly, we have got on that body not only agricultural officers and men who are doing work in various lines of agricultural research and administration, but we have also got very prominent business men in Bombay who are spending a great deal of their time on running this Committee. We have also a very able Secretary, and the combination has done extraordinarily good work.

41,464. You think this principle of organising research according to the crop rather than according to the area might be extended to other crops?—

Mr. D. Milne.

TABLE A.

Table showing selected crops with which experiments will be made during the kharif and rabi seasons by the Agricultural Department.

No.	District.	Kharif. Rice. Irrigated.	Rice. Unirrigated.	Maize. Irrigated.	Maize. Unirrigated.	Cane. Irrigated.	Cane. Unirrigated.	Jowar. Irrigated.	Jowar. Unirrigated.	Bajra Irrigated.	Bajra Unirrigated.	Cotton. American. Nahri.	Cotton. Deshi. Chahi.	Cotton. Deshi. Nahri.	Cotton. Deshi. Barani.	Rabi. Wheat. Chahi.	Wheat. Nahri.	Wheat. Sailab.	Wheat. Barani.	Barani wheat and gram mixed.	Barley. Irrigated.	Barley. Unirrigated.	Gram. Nahri.	Gram. Sailab.	Gram. Barani.	Rape. Irrigated.	Rape. Unirrigated.	Name of officer in charge of experiments.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	Hissar ...	—	—	—	—	*	—	—	*	—	*	—	—	*	—	—	—	—	—	—	—	*	—	—	*	—	*	Deputy Director of Agriculture, Hansi.
2	Hoshiarpur	—	—	—	*	—	*	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	*	—	—	Deputy Director of Agriculture, Gurdaspur.
3	Jullundur ...	—	—	*	—	*	—	—	—	—	—	—	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	
4	Ferozepore	—	—	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	*	—	—	*	—	—	—	*	Deputy Director of Agriculture, Hansi.
5	Gurdaspur ...	—	—	—	*	*	*	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Deputy Director of Agriculture, Gurdaspur.
6	Sialkot ...	*	*	—	—	*	—	—	—	—	—	—	—	—	—	*	—	—	—	—	*	—	*	—	—	—	—	
7	Gujrat ...	—	—	—	—	—	—	—	*	—	*	*	—	—	—	*	—	—	—	—	*	—	—	—	—	—	—	
8	Montgomery	—	—	—	—	—	—	—	—	—	—	*	—	—	—	*	—	—	—	—	—	—	—	—	—	*	—	
9	Shahpur ...	—	—	—	—	—	—	*	—	*	—	*	—	—	—	—	—	*	*	—	—	—	*	—	—	*	—	Professor of Agriculture.
10	Lyallpur ...	—	—	*	—	*	—	—	—	—	—	*	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	
	Total ...	1	1	3	2	5	2	2	2	1	2	4	1	1	—	3	2	2	3	1	2	2	2	—	2	2	2	

NOTE.—Experiments to be made in crops under which an asterisk is marked.
In districts where the important species of irrigated rape is *toria*, the experiments should be conducted in *toria*
Total number of experiments = 50.

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Table showing selected crops with which experiments will be made in each district of the Punjab by the Revenue Department, during the Kharif and Rabi season.

Serial No.	District.	Kharif. Rice. Irrigated.	Rice. Unirrigated.	Maize. Irrigated.	Maize. Unirrigated.	Cane. Irrigated.	Cane. Unirrigated.	Jowar. Irrigated.	Jowar. Unirrigated.	Bajra. Irrigated.	Bajra. Unirrigated.	Cotton. American. Nahri.	Cotton. American. Chahi.	Cotton. Deshi. Nahri.	Cotton. Deshi. Barani.	Total Kharif crops.	Rabi. Wheat. Chahi.	Wheat. Nahri.	Wheat. Sailab.	Wheat. Barani.	Barley. Irrigated.	Barley. Unirrigated.	Gram. Nahri.	Gram. Sailab.	Gram. Barani.	Rape. Irrigated.	Rape. Unirrigated.	Total Rabi crops.	Total Kharif and Rabi crops.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	
1	Rohtak	—	—	—	—	*	—	—	—	—	—	—	—	*	*	3	—	—	—	—	—	—	—	*	—	—	—	2	5
2	Gurgaon	—	—	—	—	—	—	—	—	—	—	—	—	—	*	3	—	—	—	—	—	*	—	—	—	—	—	2	5
3	Karnal	—	*	—	—	*†	—	—	*	—	*	—	—	*	*	4	—	*	—	—	—	*	—	—	—	—	—	2	6
4	Ambala	—	*	—	*	—	—	—	—	—	—	—	—	—	*	3	—	—	—	*	—	—	—	—	—	—	*	2	5
5	Kangra	*	*	—	*	—	—	—	—	—	—	—	—	—	—	3	—	—	—	*	—	*	—	—	—	*‡	—	3	6
6	Ludhiana	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	*	—	—	—	—	*	—	—	2	5
7	Lahore	—	—	*	—	—	—	—	—	—	—	*	*	—	—	3	—	*	—	—	—	—	*	*	—	—	*	4	7
8	Amritsar	*	—	*	—	—	—	—	—	—	—	—	—	—	—	2	*	*	*	—	—	—	—	—	—	—	—	3	5
9	Gujranwala ...	*	—	—	—	*	—	—	—	—	—	*	—	—	—	3	—	*	—	—	*	—	—	—	—	*	*	4	7
10	Jhelum	—	—	—	—	—	—	—	—	—	*	—	—	—	—	1	—	—	—	*	—	—	—	—	—	—	*	2	3
11	Rawalpindi ...	—	—	—	*	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
12	Attock	—	—	—	—	—	—	—	—	—	*	—	—	—	*	2	—	—	—	*	—	*	—	—	—	—	—	3	5
13	Mianwali	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	*	—	—	2	2
14	Jhang	—	—	—	—	—	—	*	—	—	—	—	—	—	—	1	*	—	—	—	—	—	—	—	—	—	—	1	2
15	Multan	—	—	—	—	—	—	*	—	*	—	*	*	—	—	4	—	*	—	—	—	—	—	—	—	*	—	2	6
16	Muzaffargarh ...	—	—	—	—	—	—	—	—	*	—	—	—	—	—	1	—	*	—	—	—	—	—	—	—	—	—	1	2
17	Dera Ghazi Khan	*	—	—	—	—	—	*	*	—	—	—	—	—	—	3	—	—	—	—	*	—	—	—	—	*	*	1	4
18	Sheikhupura ...	*	—	—	—	*	—	—	—	—	—	*	—	*	—	4	—	*	—	—	*	—	—	—	—	*	—	4	8
	Total	5	3	2	3	4	—	3	2	2	3	4	2	3	4	40	3	7	2	5	3	3	1	2	6	5	3	40	80

† In Panipat. ‡ Linseed. § In districts where the important species of irrigated rape is *toria*, the experiments should be conducted in *toria*.
NOTE.—Experiments to be made in crops under which an asterisk is marked.

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That is not very easy; for example, what would happen if you take up wheat in the same way? Our exports of wheat are sometimes nil.

41,465. You are thinking of the difficulty of financing?—That is one ground. If you put some money into the scheme then you can get it to go through, but if you cannot get money there is not much that you can do.

41,466. How about the oil seeds? Could you conceive of a way in which an organisation dealing with the oil seed trade could be financed by the trade?—I think that if it is to be run on the same lines as the Indian Central Cotton Committee, it will not be very popular. No one likes extra taxation. The question is whether one can find the money from existing funds. No one is keen on further taxation. Everyone is against that.

41,467. The cotton industry does not resent the cess?—They are thinking a little more about it, now that the prices of cotton have come down so much.

41,468. The cess has been reduced?—It is now 2 annas per bale instead of 4 annas per bale as formerly.

41,469. Are there any other crops in this Province which might be organised in the same way as the cotton?—If you start putting a cess or tax on crops people will be rather against it. But I do not see why we should not have something on the lines of that for sugar. You have a Bureau of Information for sugar at Pusa, and the provincial people all benefit by it. I think funds for new work will probably have to be found by the Provinces themselves.

41,470. The prospect of organising these trades from the producer to the manufacturer and the final distributor offers certain attractions?—It does; if you can bring in members of the trade as in the case of cotton it will be a very great asset. We have in our Provincial Cotton Committee people who are interested in trade and they are always helpful.

41,471. I should like your views as to the extent to which the Provinces are in touch with each other in the matter of research; are you satisfied with that?—I think that there is much more to be done in that way. These sectional conferences that are held at Pusa are extremely good things. I do not see why the main crops, or at least the main divisions of work, should not have each a conference of that sort and meet in other Provinces which are carrying out the particular work concerned. I find that a great deal of good comes out of these conferences, not so much from what actually takes place in the formal work of the conference but from mutual discussions. One finds that these very often remove difficulties. In short, I think that these meetings at Pusa are very valuable as affording the men opportunities for discussing their problems.

41,472. Another idea would be a meeting between the representatives, say, of a group of Provinces?—Yes.

41,473. That will be helpful, you think?—Very helpful indeed; I think all that sort of thing should be encouraged.

41,474. Do you think that the Government of India, with the Imperial Agricultural Department at Pusa to support it, might take a rather more leading part in arranging co-operation between Province and Province?—It would be a good thing to do so. I think that that is a very important function of Pusa.

41,475. You say in your memorandum that there is one direction in which the Government of India might be able to assist, namely, in the provision of central research officers for particular subjects, who would be available for employment in a Province for a definite period of time?—Yes.

41,476. It is a direction in which you would like to see developments, is it?—Yes, it has been useful in the past and I feel sure it will be so again. The point there is that as the problems arise you would have trained men who would be capable of starting work straight away. We have had one or two officers of that sort already in the Punjab.

41,477. Has it occurred to you that if there was in existence, as part or the organisation of the Central Government, some Body able to examine proposals for joint research between Province and Province and with a fund at its disposal to meet the expenditure direct if it approved of them, that might assist co-ordination?—Yes, it would if you had the money. That comes more or less to the same thing as the Indian Central Cotton Committee.

41,478. In practice, do you meet with schemes or rather subjects of research which, in your view, would be capable of being broken up into component parts, one part being some fundamental problem which might be dealt with at Pusa, another part being, let us say, a botanical problem which might be dealt with in the Province, and so on?—Just at the moment I cannot think of a particular item. In every problem that one takes up there is a part of it usually that can be taken up in the central Institute. If one starts on a problem one begins at the rough outside, but it gradually broadens out, and one finds that one has to set aside many fascinating lines of study and carry on with what will be of practical value quicker. There are plenty of lines of research which Pusa could help the Provinces with, although a good deal of each is usually affected materially by local conditions, and that is best done in the Province itself.

41,479. What Pusa varieties are popular in this Province at the moment?—The best thing we have got in sugarcane, C.O. 205; I am talking of the Imperial Department of Agriculture.

41,480. No Pusa wheats at all?—They have not suited us very well. I think one of the causes is that the local environment is very, very different from Pusa.

41,481. Are you distributing any Pusa varieties at the moment?—No; we found our own varieties more suitable for the local conditions. Pusa 12 is still being tried in certain parts of the Province. It is a wheat which requires rather a damp soil and a good deal of water, and that is not the kind of thing we have in the Punjab plains very generally. We have a dry, hard climate up here. With good land and plenty of water supply probably Pusa 12 would do fairly well. It is a soft grained wheat, but is still hanging on in a few thousand acres.

41,482. Various proposals have been put forward for financing agricultural research by means of a cess. Sometimes it is suggested that it should be a cess on agricultural produce exported from India and at other times it is suggested that there should be a general cess on an acreage basis. Have you anything to say on those two proposals?—I think that any extra money would be a good thing; but extra tax in any way would be rather objected to. But why can we not have a bigger proportion of the revenue money of the Province set distinctly apart for agricultural development, or something of that sort? If that is feasible the money already got in as revenue might be utilised.

41,483. Who directs agricultural research in this Province? Do you do it yourself?—I do it in consultation with the heads of the different sections concerned. They draw up their programmes and they come to me. If there is anything that I do not approve of in them I have the option of saying so.

41,484. *Professor Gangulee*: You have no such thing as a Research Council?—We are starting one again. The Department did start one, and it did not work well; that was many years ago, and we have just decided to start a research committee again.

41,485. *Professor Gangulee*: Could you tell the Commission why it failed?—I think that each researcher was so busy on his own line of research that he had not the time to look at the other man's work, and the Director did not consider that it was really very helpful.

41,486. *The Chairman*: In fact, the Research Council can only be an advisory body to the individual responsible, and the latter's job must be a one man's job, must it not?—Yes; at the same time I should like to see a research committee tried again. One point of advantage about it is that when a man takes up a certain line of work and he wishes to dovetail it into another man's work we might be able to arrange with the other man so that he might take up that particular piece of work and help the first man through.

41,487. Are you satisfied with the botanical side of your research work?—We are all in a state of change here. In the old days I was the only Imperial officer in the Botanical section, and had to tackle most things myself; but now the work is being broken up. The horizon of work has widened so much that we want a man on each important crop with a staff to assist him. We have got a Specialist officer on cottons, partly financed by the Indian Central Cotton Committee, and he spends his whole time on that work; he has got a farm of about 218 acres with a good staff for it. Then we have a Cerealist, a man taking up work on the cereals; we have also got a man on fodders, and so on. As the horizon widens we are dividing up the work, and each of these crops becomes a one man's job.

41,488. How about the calibre of the men employed? Are you satisfied with that?—We have not a very wide choice. Up to date not very many men from the Punjab have taken up agriculture, or rather the various phases of agriculture, and personally I should like to see a keener competition than there exists at the present moment. We are always in great difficulties when we want to fill a post.

41,489. If you are unable to find the right man in the Punjab would you be supported if you went elsewhere in the world for him?—It is difficult to say what other people would do, but my own feeling is that there should be no difficulty.

41,490. I suppose that the broad view to take is that if you can get the right man locally in the Province then by all means take him, but if you cannot, it is no use taking one who is not up to the job?—Yes, as a matter of fact we are trying to get one or two men from outside, and I am being supported all round in this.

41,491. *Professor Gangulee*: Outside India or outside the Province?—Outside the Province and even outside India.

41,492. *Mr. Calvert*: Would it pay sufficiently to get a real expert?—I feel that the salary is sometimes very low, and therefore not enough to attract good men.

41,493. *The Chairman*: After all a man in an important position of that sort may affect the prosperity of an enormous number of cultivators over a wide area in the Province for the next fifty years, may he not?—My personal feeling is that if you get the right type of man he is worth his weight in gold, and that it is a sheer waste of money to go in for one who is not up to the standard, as the zamindar will get nothing out of it. I think it is essential that we should create a keen competition by offering attractive terms. We should then be able to choose the best men from a large number of applicants.

41,494. A word about this prospective extension in the numbers of your staff throughout the Province: are these men to be part of the new Superior Provincial Service recommended by the Lee Commission?—Yes, that is the idea.

41,495. Have you definitely commenced recruiting for that Superior Provincial Service?—What we have done so far is this: we have taken men on a temporary basis until the rules about the new service are out,

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and if in the meantime we find them suitable these men will be offered permanent posts in the new Service.

41,496. *Sir Henry Lawrence*: What is the present position with regard to these rules?—I think they are now on my office table. As a matter of fact, I believe they are waiting for me to see them. I have had a man in my office on this work for the past few weeks.

41,497. Is this a proposal that you are making to the Government?—The case has come down to me from the Punjab Government and I have been asked to frame certain rules.

41,498. *The Chairman*: Is the matter not still with the Government of India?

Mr. Barron: The same thing has got to be worked out for a great number of other Services, and we put an officer on special duty for a short time in the Secretariat to lay down certain general lines for the various departments and these general lines are being applied by the various departments to their own men.

41,499. *Sir Henry Lawrence*: And after that they will have to receive the sanction of the Government of India, and probably also of the Secretary of State?—Very probably.

41,500. *The Chairman*: What salaries are you recommending?

Mr. Barron: We have started with these temporary men about whom reference has been made by Mr. Milne. They are getting Rs.300 rising by Rs.40 for a probationary period of two years. Before the end of that period the new rules will have come into force.

When the new service is opened what pay is it suggested to give them?—The present pay of Rs.300 rising by Rs.40 will be taken as our guide. The maximum has not yet been decided.

41,501. *The Chairman*: Are you carrying out any post-graduate training in the Province?—Yes, at Lyallpur where we have started with one or two students this year; it is open to anybody to come in and study. In the Veterinary College there is a refresher course.

41,502. How many men are in fact undergoing this course of post-graduate training?—If you mean the M.Sc. degree then there is just one at present.

How about the post-graduate training which fits a man for higher research?—There is a definite course and a definite degree, the M.Sc., attached to it, that is all.

41,503. Is any scheme being contemplated for training after the final degree is taken?—You are perhaps thinking of our scheme for the training of students at Shergarh?

I shall come to my question in a moment, but let me hear what you have to say about this first?—I think the Shergarh case has come back to me again. It has been altered somewhat, with the result that I have got to look it up again. But I understand that we will have a scheme, whether it is what I put up or not I do not know. I think that this scheme is very important. I am very keen on it. I have a feeling that no boy who goes out raw from the University is fitted to start as an Agricultural Assistant or to farm on his own account without considerable danger to himself and others. A boy who comes out of College thinks he knows everything, and it is only after the corners have been knocked off him that he begins to realise that the fundamental principles which he was taught in college are sound only if they are applied in the proper

way. It is extraordinarily easy to misapply them. That sort of thing has happened in every country in the world. I feel that this scheme is helpful in that way. It puts the boys in a position where they have to look after themselves and do their own farming, while they are given a helping hand by the trained men of the Agricultural Department.

41,504. As Indianisation proceeds in the Agricultural Service, do you contemplate Pusa taking a greater part in post-graduate training than it has in the past?—I think it will if it will specialise. I think, however, the Provinces will also take a greater part in that work. We ourselves are gradually getting more facilities for training men and I have no doubt that other Provinces are also doing the same. Pusa would probably go in for a greater degree of specialisation.

41,505. If you had a teacher or teachers of world-wide reputation at a centre like Pusa they would attract pupils from all over India?—Yes, for special subjects. That is where other countries have gone ahead of us. They have specialised more than we have.

41,506. What is your view about the best system of training Indians? Do you believe in their going overseas for a certain part of their training, or would you prefer to see them trained in India?—I would like to see a boy who is going to work in the Punjab take his B.Sc. in the Punjab and then go elsewhere. Travelling is an excellent thing for any man, because it shows him other people actually making a living by doing things in a way different from that to which he has been accustomed. This is more convincing than any lectures can ever be.

41,507. At what stage would you send them?—After they have taken the B.Sc. There is one point in this connection which I do not think has been sufficiently realised. We have a wonderful range of systems of farming in the Punjab and many variations of climate from Simla hills, where crops suitable to colder climates are grown, down to the hot dry plains of the Punjab. There is irrigated land and *barani* (rainfall watered) land. There is a greater range of crops here than can be seen in most other countries. I feel that the general education given for a B.Sc. Degree at Lyallpur is extraordinarily wide and a very fine training for a young man. I have often thought it would be a good thing for post graduates from other countries to spend a year in the Punjab.

41,508. There again it is very largely a matter of obtaining the services of a teacher of world-wide reputation?—Yes.

41,509. Turning to your written memorandum, you give us in that memorandum a fairly complete picture of your educational system, which is also described in the Provincial memorandum. You have been engaged in this experiment of introducing agriculture into vernacular middle schools for the last five years?—It has been going on since 1918.

41,510. Would you agree that although this system has now been running for some years, it is still more or less in the experimental stage, or do you think, you have had enough experiment to say that it is a success?—I think it is playing a very important part in the education of young people in this Province. If these schools can open the minds of young boys in the Punjab to see that there is a possibility of improving agriculture by the application of science to it, they will have done one of the biggest things for education that has ever been done. Amongst the older people who have never had the opportunity of studying agricultural science it must be largely a matter of trust when they adopt anything new and if you can get into the minds of these boys the idea that it is possible to apply science to agriculture, and thereby improve the income of farmers from their land, you will at once have them seeking after knowledge. You cannot make farmers of those boys. That would be aiming too high. I do not

agree with the idea that we are going to send them back to the land with a complete education as farmers; my aim is to send them back with an inquiring mind asking for help as to how they can enhance their income from their holdings.

41,511. Are you satisfied with the results obtained?—I think they are good, but of course, they could be better. These schools have made an excellent beginning. They have a total of 8,700 boys now, whereas a year ago the number was something like 3,000. In the near future, I look forward to a rise in the standard of teaching. At the present moment the teachers are Senior Vernacular Middle School teachers, who get a year's tuition at Lyallpur, and you cannot teach a man very much about agriculture in a year if he has not been an agriculturist before he entered the College. We must not expect too much, but I think, there will soon be a demand for men who have had a thorough training in agricultural science to act as teachers in the schools.

41,512. Have you any indications that many of these boys are settling down on their farms?—I got a note on that point from the Agricultural Inspector of Schools, but I noticed that Mr. Stewart had given you a list of where these boys went to, so I did not mention that in my note.

41,513. Do you form the impression that this system has not had an unsettling effect on the mind of the boys?—It will have the effect of making them ask for better things; education always does. I think every man ought to be able to read and write, and that the three Rs. should be the principal things taught in these schools together with an appeal to the mind of the boy, similar to that which Baden-Powell has made with his Scouts. There are many things we can teach them which will be of real value to them as agriculturists, although we cannot make them farmers.

41,514. On the whole you are well pleased with the results?—I think tremendous progress is being made.

41,515. With regard to the Agricultural College at Lyallpur, are your teachers there carrying out research work?—They carry out a certain amount in their spare time, but they have not time to do much.

41,516. Are the research officers giving any lectures there?—We are passing through a transitional stage. When first I went there, I had to do most of the teaching and look after all the research work in the field; also I had to supervise botanical work throughout the Province. Later I got a certain amount of assistance and was able to give part of my teaching work to others, and as we got more staff, part of my research work also. In some of our sections we now have a number of Assistants who do nothing but research, while others are doing teaching and research. We still need more staff and as time goes on we shall have some men who will be mainly teachers, and others mainly research workers. In my opinion every head of a research section should do a certain amount of teaching in his particular line of work. It is a great advantage to students to come across a man who is enthusiastic in his own line, as the head of a piece of research work usually is. My idea is that these researchers will give a certain number of lectures in the general course.

41,517. As long as the research worker is not overloaded with teaching? —Yes. We are unloading research work from the teacher as fast as we get staff to do it.

41,518. And also so long as the research worker is not expected to lecture on subjects which are essentially elementary?—Yes. But men doing teaching work will have to teach elementary subjects, and every teacher should have a certain amount of research to do to prevent him becoming stale. A man who does teaching for four years or more without doing any research

work at all is apt to become stale. He has not that vim and energy which infect the students and make them interested in their work.

41,519. I gather from your note it is not your view that it would be advisable at this stage to think of opening any other agricultural college in the Province. Is there a large demand for that?—Occasionally we have a request for it, but I think, on the whole, I would not open another college for some time to come. If further extension is needed, it should take place at Lyallpur. It is far cheaper and better to extend a single centre and equip it well than to have a number of isolated little centres which are badly equipped.

41,520. Do you think the demand for another college is due at all to the view that the existing college devotes itself mainly to the advancing of agriculture in irrigated areas?—I have heard that said fairly often, but I do not agree with it at all.

41,521. Do you think you devote sufficient time to the problem of *barani* areas?—Yes. We have farms in different areas which students visit on their tours.

41,522. *Mr. Calvert*: Is there any *barani* land at Lyallpur?—No.

41,523. Is there any well-cultivation?—No. Students have to see that on other farms when they go an tour. The fundamental principles of agriculture are taught at Lyallpur, and added to this the lads go on tour.

41,524. *Sir Ganga Ram*: Where have you a *barani* farm?—At Gurdaspur. I am also starting a new one of about 500 acres at Sarsa.

41,525. *Professor Gangulee*: Do you take your students to Gurdaspur and keep them there for some time?—We take them on tour to various parts of the Province.

41,526. And keep them there for some time?—For some days. They go on tour for a fortnight or three weeks at a time.

41,527. *The Chairman*: Do you think as a department you are giving a fair share of your attention to the problem of the *barani* areas?—I think it is very natural that irrigated areas near Lyallpur should come first. We started the college there, and we are gradually feeling our way to other areas, but it is only within the last couple of years that we have been able to get Agricultural Assistants even in some of the outlying districts like Campbellpur. I think that it is very natural that the college should have had its greatest effect on the area in its immediate vicinity.

41,528. At the same time, it is true that the cultivators whose well-being and general economic status most require attention and advancement are the cultivators in the *barani* districts?—I think they are more backward in some ways, but I do not see how else the work could have been started. A beginning had to be made somewhere and the fact that people elsewhere are crying out for help shows that something has been done in the canal colonies, at any rate. We hope to give the *barani* districts more and more attention as time goes on.

41,529. I am going to read to you a short extract from the preface of the five years' scheme presented by the Officer on Special Duty, under date 22nd April, 1926, page 2.—"Little has been done except in connection with the Gurdaspur farm to solve local problems where they differ from those of districts under perennial irrigation. Neither staff nor money has the Doab, in the *barani* areas of the north and south-east Punjab or the been available for research and experiments in the well-irrigated tract of well-cum-canal irrigated areas of the south-west. Broadly speaking, it has been the relatively large owner in the colonies and his tenants who have reaped by far the greater portion of the department's harvest. Very

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little advance has been made by the small-holder outside the colonies." Do you agree with those words?—Not altogether, but very nearly. We discussed all this before that memorandum was written and I did not agree with the whole of it. For example, in the colonies and outside them, the small owner has his improved varieties of cotton and wheat and has the benefit of improved cultivation and implements, just as the larger cultivator has. The fact is, however, that we started in the canal colonies, and I think it would have been wrong to dissipate our energies in the scattered corners of the Punjab; we were able to make a greater effect by not scattering our energies.

41,530. On page 158 of your note, in answer to our Question 2 (vii), there is a proposal to increase the knowledge of English of those students at the Agricultural College, at the expense of one year's training in practical agriculture. I do not quite gather from your note whether you favour the proposed change and think the sacrifice worth while?—I must confess I am a little doubtful about this; it seems to me to be a most important thing that we should get the right class of men into the college: the middle class farmer; if this is going to put that education beyond his reach, then I think it will do us a great deal of harm. I have a feeling that an important factor in the success which we have had so far has been the fact that we have been drawing our men from the right kind of farmer, that they have been going back to their villages, talking to their own people, carrying on their work in the villages. I would not like to see University education confined to the rich. As regards the question of raising the standard of entrance to the Agricultural College, the position at the present moment is that the Principal of the College with his officers will try to formulate a complete scheme, and see how far we can solve the difficulty by giving scholarships and that sort of thing.

41,531. The point is that this change, if it is approved, will throw the whole expense of education for an extra year on the parent?—Yes.

41,532. *Sir Harry Lawrence*: What will be the cost of making that last year free by special scholarships to all the students who take the fourth year?—It costs the student about Rs. 40 or Rs. 45 a month.

41,533. How many students are involved; what is the total sum at stake?—That will vary as time goes on.

41,534. What is the number now in the fourth year?—41 in the fourth year; this year it is a big class; we have not had as many as that before.

41,535. So that it could be done at the expense of Rs.25,000?—But then you see we may increase the numbers.

41,536. *The Chairman*: I do not feel quite certain as to the meaning of what you say on page 165 in answer to our Question 4 (*a*): "If any arrangement could be made between the Central Government and the Provinces whereby capable and trained experts could be available for work in a Province when required, it would be an advantage." Are you speaking there of what we were talking about before, namely, the making available of experts for employment for a period in the Province and under the Provincial Government?—Yes, that was the idea there.

41,537. Do you contemplate at all the setting up in provincial areas of research stations under the Central Government?—That is a matter that would have to be considered. What are the conditions on which they would be set up? Do you mean permanent places? I should like to see a complete scheme put before me before I said anything on that. There is no doubt whatever that the Provincial Government itself will gradually have more and more centres of research; for example, at the present moment we have a Chemist at Gurdaspur on sugarcane. Last

year or the year before we only had a man who went there for a few months. That kind of thing will develop.

41,538. No question arises of interference with provincial autonomy; these stations will work just as independently of the Province as Coimbatore does of Madras?—Yes, or as Karnal does in the Punjab at the present moment. One would have to see the conditions before expressing an opinion.

41,539. On page 166 in answer to our Question 4 (c) (ii), which deals with Railways, you say the authorities have a programme of development which doubtless they will lay before the Commission. We have not yet had presented to us anything of the sort. Can you tell the Commission whether Mr. Mitchell when he appears will be able to speak to that?—He will say something about the agricultural railways; I think he will probably be able to give you most of the information if he is warned in time before he comes.

41,540. I am interested to read on page 167, in answer to our Question 4 (c) (vi), that Mr. Brownlie looks forward at no distant date to broadcasting taking an important place in the general education of the rural population. Do you agree with that?—Yes, I think so; I do not see why it should not.

41,541. Would the problem arising from having several vernaculars in a limited area apply in this Province?—Of course, some difficulties would arise in that respect, but a great many people understand English.

41,542. In your note of evidence you do not say anything in answer to our Questions 5, 6 and 7. Question 5 is on Finance and the question of affording credit for agricultural operations; do you wish to say anything on that?—No, I think others will be better able to deal with that.

41,543. Do you wish to say anything on the problem of agricultural indebtedness?—No, I think you will find others will be able to deal with that also.

41,544. And in the same way with regard to fragmentation?—Mr. Calvert can give information on that subject.

41,544A. But he is a Member of the Commission, and we want our information from the witnesses?—There is only one thing I would like to say about consolidation of fragmented holdings, and that is that I think it is very wonderful work. Mr. Calvert knows far better than I what difficulties there are in getting people to agree; there is no doubt whatever that from an agricultural point of view consolidation is a very great boon to the Province.

41,545. Has consolidation resulted in a great increase in agricultural efficiency?—We saw some consolidated holdings yesterday and the difference is the difference between land which is practically useless and land which is giving full agricultural value.

I greatly regret that an attack of influenza prevented me from seeing that work, but my colleagues have been duly impressed.

41,546. Are you satisfied with the degree of touch existing between your department and the Irrigation Department?—Yes, I do not think we have much to complain of; we find they are always very willing to help us in every way possible; I do not know what else is wanted.

41,547. It is very important that the agricultural aspect of an irrigation problem should be kept in mind, and *vice versa*, is it not?—Quite; we find the irrigation officers extremely willing to come and help us whenever they can.

41,548. How about advice to cultivators as to the amount of water required on any particular crop? Do you and the Irrigation Department

agree; for instance, how many inches do you say it takes to irrigate a crop of sugarcane?—It may get anything from twelve or more waterings of about 3½ inches per watering.

41,549. Do the Irrigation Department agree with that?—This sort of thing is settled, I think, in close collaboration with the cultivators themselves.

41,550. But there is no conflict of view between yourselves and the Irrigation Department?—None.

41,551. Do you think the problems of waterlogging and salinity are likely to increase rather than diminish in the future?—Yes, if they are not tackled.

41,552. Do you think they are likely to increase to any serious extent?—Yes, I think it is a subject that wants tackling very much.

41,553. Do you think it is likely that they will present such a serious problem as to make it necessary to consider whether important sums of money should be disbursed on lining canals?—I think so; I think the problem is very serious.

41,554. I gather that the economies of the tube well have yet to be worked out?—Yes; it is a very expensive system of lift irrigation, and it is a question of trying to get the costs down to something that the zamindar will be able to face.

41,555. And yet pumping water from the subsoil by means of a tube well is one of the ways of meeting the danger of waterlogging, is it not?—Yes.

41,556. Do you think you might come to a point where you would have to consider whether it would not pay Government to assist cultivators willing to use tube wells in order to minimise the risk of waterlogging?—I think it is a question, first of all, of what is the cheapest way of lifting the water from the sub-soil, whether by pumps on ordinary wells or by some other method.

41,557. You mean, looking at the matter as a drainage problem?—Yes; I think it is a part of the work which requires a good deal more investigation still, to find out just what is the cheapest way.

41,558. I think that in the provincial memorandum it is made plain that the boring of tube wells is under your department; is that so?—Yes; the Agricultural Engineer does it.

41,559. You think it is a sound division of functions between yourself and the Irrigation Department?—I think so; I think it has worked out all right. We happened to have a man in charge who is the inventor of strainers and other parts of tube wells.

41,560. I think that you have considered the advisability of Government financing an experiment to discover whether the grouping or putting together of a battery of tube wells operated by one single prime mover is likely to be successful?—We are still considering the details of the scheme.

41,561. But the scheme itself is not yet approved, is it?—We have just engaged a special officer to work on lift irrigation. The present Agricultural Engineer has not really had the time to work out these schemes. They involve searching about for a proper site, working out the details of cost and so on.

41,562. I think this scheme, designed to discover whether a battery of tube wells would too soon exhaust the available water and also what the economics of such a scheme might be, has not been approved?—It is approved to this extent, that we have got an officer appointed recently on lift irrigation and we are working out the scheme. We want to see it on paper in detail and then a decision will be come to; it is under investigation

41,563. But not approved?—Yes, that is the case.

41,564. I see from your five-year programme that the agricultural economics, quite apart from the problem of sub-soil water supply, is rather an open question. The proposal there, I see, is for Government to work the battery and to send the water to the cultivators just as the water is carried by canals?—Yes.

41,565. I am interested to see on page 170 of your note in answer to our Question (8) (*b*) you suggest that the volumetric system is being experimented with; will it be adopted in the near future?—As a matter of fact, it has been tried, but under the present conditions I am not sure that it has got very much chance of success. One reason is that, as far as I can see, the crops grown for green manure at present are not assessed water rate at all, and crops for fodder are only charged at Rs.2 an acre. Now, if a man takes his water on a volumetric basis he has got to pay for all that.

41,566. The problem is dealt with at some length in the provincial memorandum, and the writer comes down definitely in favour of the acreage basis. Certain experiments have been made in charging water by volume; is that so?—Yes.

41,567. Have you ever heard it suggested that after arrangements have been made with the cultivator for an experiment on a volumetric basis the scale of charges has been altered and the dice loaded against the cultivator?—I do not think I have heard any definite charge of that sort, but there is generally a grumble that it is more expensive than the other system; that is, that the charges are too high.

41,568. With reference to Question 9, are you conducting a soil survey in the Province?—For want of staff we have not been able to start this really thoroughly. Some soil samples have been taken here and there. I hope that Dr. Lander will now be able to start it; he has got a Second Agricultural Chemist and a certain staff; he may be able to do something about it; but it is rather a big job, and so far it has been limited to soil samples taken here and there.

41,569. Do you think it would be an advantage, if you could afford it, to have a soil survey on a comprehensive scale?—Yes; I think it ought to be done. Dr. Lander is carrying out a piece of work at present on the constituents of soils in relation to the crops grown and their food values.

41,570. Would it be worth the money, do you think?—Of course, it could be made a very big thing. I think there is a great deal of room for very useful work in that line.

41,571. In answer to our Question 9, you say: "In experiments with ordinary cultivation by bullock power *versus* deep cultivation by steam tackle, the results were in favour of deep cultivation as in past years." Is that for fertility, or does that include costings?—I was thinking of the crops got.

41,572. The actual yield?—Yes; but we have the costings, which could be worked out.

41,573. It does not necessarily follow that because the yield is better the steam tackle pays?—Quite. In that case I looked at it merely from the point of view of progress in reclaiming the land and the crops got.

41,574. Then, on page 174, you describe the method employed to encourage cultivators who have enterprise to reclaim *bara* land. Is it possible to find good land near the *bara* land?—Yes.

41,575. In answer to our Question 10 (*a*) on Fertilisers, you say: "Trials with artificial manures have not been very encouraging," and I see that you say on page 175 that in this matter more investigation is required. Have you, in fact, firm ground on which to say that your results

are so far discouraging?—The experiments have been going on for a number of years, and I think more work is needed; but I am not very hopeful of very much advantage being shown in the application of such manures as phosphates and potash unless one is going to increase the intensity of cropping.

41,576. As to nitrates you are more hopeful?—Yes.

41,577. I see that sales of nitrates have increased from 500 maunds in the *kharif* of 1925, to 2,500 maunds in the *kharif* of 1926. How do you come by those figures?—These are figures that have been given to me by one of our own Diplomates from the College who has been taken on by a firm. I do not know whether the firm would object to my mentioning this, but these are the figures that this Diplomate has shown.

41,578. Can you tell us whether they have got a monopoly?—I do not think so.

41,579. So that these figures are only some indication of the percentage rise which may be expected?—As a matter of fact, a few years ago there was nothing of this sort sold in the Punjab. This man was put on, and he has done all the push that has been done. I think these are practically all the nitrates sold in the Province.

41,580. Have you any plans for experiments on fertilisers? You suggest the need of such on page 175?—We are keen to help firms by laying out pieces of land on our farms, applying the manure and noting the results.

41,581. I was a little puzzled on page 176, in answer to our Question 10 (*a*), when you say: "I also feel that the waste, which occurs by burning of cow-dung, is not as great as is generally supposed. The only loss that takes place by burning is that of organic matter and nitrogen, and obviously the climate, soil and other conditions in the Punjab provide amazingly good facilities for the recovery of these losses." I do not quite see how they provide facilities for the recovery of organic matter?—By the rapid growth of plants. Plants here grow much more rapidly than they do at Home.

41,582. With regard to seed distribution, do you see any signs of farmers collecting seed of improved varieties grown on their own holdings for use in the following season?—Yes, they are doing it. Our seeds are now being sold by certain men, and this to my mind is the beginning for seed merchants who will sell our seeds to the cultivators. We charge a profit of about 4 annas a maund for it.

41,583. Why do you want this margin of profit on the seeds that you handle?—We want to stop people from using them as food; we do not want the people to buy our wheat grain and eat it. We put on this charge in order to make it cheaper for a person who wants to get his grain for food to go somewhere else and buy the ordinary stuff.

41,584. At that season of the year when the ordinary cultivator buys his seed grain, might he also buy grain for food?—No; you are up against the people in the towns as well, as anybody may buy.

41,585. You could not control the destination?—That is so.

41,586. You are satisfied that it is in the public interest that you should charge a slightly higher rate?—Yes, it ensures that the improved seeds are to be used for sowing.

41,587. You think that these farmers who are dealing in seeds of improved varieties are likely to extend their activities into the field of moneylending?—I should not be a bit surprised if they did, because it is remunerative.

41,588. Is there any particular gap in the crops of the Province that you would like to see filled?—I do not know of any crop that can be taken in with advantage.

41,589. Let me put the question in another way: supposing you were asked to choose any crop for an ideal farm, what would you go for?—I think food crops in the summer would be a good thing. We have a plentiful supply of water to grow them with; as a matter of fact I would go for anything that would add to the income of the farm in any way.

41,590. In estimating the total increment likely to result from the extension of an area under approved varieties it is not easy to make any allowance for deterioration of seed. Do you find much indication of deterioration of your improved crops?—I do not think there is very much. Of course the case of cotton is different from the case of wheat. Take any of these Punjab wheats; I do not think that any deterioration has set in. In the case of cotton you have crossings taking place, and that has got to be guarded against; of course you do not get a cross between a *deshi* and an American cotton.

41,591. In answer to question 12 you say: "The *deshi* plough is not an efficient tillage implement." Is that view founded on experiment? Are you quite sure that inversion is as important a factor as you suppose?—Even if it is not, the *deshi* plough is not an efficient implement because it does not stir up the soil efficiently. It is not an efficient "cultivator" implement, as we call it at Home.

41,592. I wonder if you could tell us whether you have tried or seen any experiments with both *deshi* implements and improved implements?—I think one of the finest demonstrations I have ever seen was at the Oat Hay farm at Montgomery, where one square of land was cultivated with *deshi* implements and another with improved implements. In that case there was a crop of cotton side by side, and one system of cultivation was giving about 12 to 14 maunds of cotton and the other about 4 to 5; such results were being got all over the place. The cultivators in the latter case were asked to cultivate in their ordinary way, and side by side the improved implement was used, with the results I have just mentioned.

41,593. Then on the question of the importance of inversion, apart from the efficiency of the implement for tillage, are you satisfied that inversion is a very important point here in this climate?—Probably not as important as it is at Home.

41,594. Have you ever carried out any experiments designed to settle the question of inversion against non-inversion?—I do not think that I have except in such cases as these just mentioned.

41,595. On page 189 you say: "One of the most important obstacles to the better cultivation of the soil, and to improved farming in general, is, in my opinion, the *batai* system of leasing lands which always gives the landlord a large share of any improvement effected by the tenant." What is the *batai* system exactly?—It is a system where the landlord and the tenant share the crop that is raised.

41,596. Is that the custom?—Yes.

41,597. Do you think it is likely to give place to a fixed rent sooner or later?—Yes; under the *batai* system it seems to me that whatever extra crop the cultivator raises that amount is always shared by the landlord.

41,598. Then you say lower down that "green manure has been found to be very profitable wherever tried in the Punjab plains, and to encourage the practice Government charges no *abiana* (water-rates) for a crop grown and ploughed in as green manure." Does that cost Government very much as a concession?—I have not got the figures here, but I can get them for the Commission.

41,599. Would you get the figures for us?—Yes, I will.

41,600. With regard to this problem of implements I want to know whether your Agricultural Engineer who is responsible for your tube well is

also responsible for making experiments designed to improve implements?—Yes, he deals with the more intricate implements; the Deputy Directors deal with implements of a simpler nature. A great deal has been done in that particular line. We are getting an engineer now who will be put on to the more intricate implements.

41,601. He would have nothing to do with well irrigation, would he?—There will be another man for that. It is a case of the work expanding, and we are meeting the case by increasing the engineering staff.

41,602. You say that the utility of the reaper is appreciated, but the cost is still high, being about Rs.450. What class of reaper is that?—The common type of reaper is the Raja reaper; it is more or less a mower than a reaper.

41,603. Is there any hope of your being able to evolve a cheaper and more satisfactory reaper?—One of our difficulties here with regard to reapers is that in the irrigated areas little banks or bands are put up to keep the water in separate beds or plots, and to deal with that state of affairs special apparatus is needed This question has really not been taken up seriously.

41,604. Have you studied the attachments made to various implements in Australia to enable them to jump stumps?—I do not think I have.

You might possibly obtain very useful hints from them.

41,605. On page 41 in answer to Question 14 (*c*) you say: "Firms are now asking for the services of men trained in the Agricultural College to represent them among farmers." Have there been cases of firms asking for graduates from your college?—Yes, one firm got a man and another has asked for one. The first one did not stay very long, but went off to farm on his own account.

41,606. On page 196 you say that the veterinary teaching work of the Lyallpur College is carried out by a Veterinary Assistant, who is stationed there. Is that the veterinary side of the ordinary agricultural course?—Yes.

41,607. There is no veterinary training there?—We have merely the sort of veterinary training that an agriculturist gets. It is not training for the veterinary profession. The Veterinary College does that.

41,608. Have you anything else to say about veterinary training as such beyond what you mention in your note?—No.

41,609. You give the Commission your views on the question whether in a Province the Veterinary Service should be subordinated to the Director of Agriculture, and you say that the existing arrangement is working well?—As far as I can see, from a provincial point of view, it is working better than it would if there was separation. Veterinary officers, of course, would like to have more plums for their Service.

41,610. Reasonable prospects of good posts as a reward for long and efficient service are important in relation to efficiency, are they not?—Yes.

41,611. But I understand you are not in favour of the appointment of an officer in the capacity of Veterinary Adviser to the Government of India, nor would you be in favour of the appointment of a Veterinary Adviser in each Province?—If you mean that the Veterinary Adviser would be separate from the Director of Agriculture, I am not in favour.

41,612. Would you put the Imperial Veterinary Department under the Agricultural Adviser?—Yes. The position is that our Chief Superintendent here is an expert in his own particular line in the same way as the head of any other section in the Agricultural Department is. I cannot see what advantage there would be in divorcing these two.

41,613. Do you think that the fact that the Veterinary Service is a professional Service has any important bearing on the problem?—A chemist

is a specialist officer in the same way as a veterinary officer is, and so is a Bacteriologist or an Entomologist.

41,614. Are you satisfied with the manner in which the veterinary hospitals under District Boards are being conducted?—Yes.

41,615. Are the members of the District Boards taking an interest in the veterinary side of their responsibilities?—I think so.

41,616. You are contemplating a very considerable extension of veterinary hospitals under District Boards?—Yes.

41,617. Will those Boards be able to finance these veterinary hospitals without assistance?—We doubt it. Although up to the present District Boards have always been able to provide their buildings and have told us they would provide subordinate staff, medicines, and so on, it is now proposed to help the poorer District Boards with a grant for buildings, and it is quite possible some of them may also have to be helped a little in the maintenance of their hospitals.

41,618. Is there any difference between the training of a Veterinary Assistant and that of a Veterinary Assistant Surgeon?—Yes. The difference has arisen in the evolution of the Veterinary College. The Veterinary Assistants are men who went through a three years' Vernacular course in the Veterinary College. In 1920 or 1921 no students were taken into the Vernacular course. Since then there has been a four years' English course, and the men are now getting a very much sounder training in the sciences underlying veterinary work and are called Veterinary Assistant Surgeons. Some of the men we have as Veterinary Assistants are really men who have taken a two years' Vernacular course.

41,619. Is there any difference between Veterinary Assistants and Extra Veterinary Assistants?—No.

41,620. The extra men are extra to the ordinary establishment?—Yes, to look after cattle disease, and so on.

41,621. You say in answer to Question 15 (*h*), "If the Muktesar Institute could provide a better class of Research Officer . . ." Are you satisfied with the class of research officer provided?—We have none.

41,621A. That is a different matter?—I mean a better class than we can find ourselves. We are very anxious to find men for research under the Punjab Veterinary College.

41,622. In answer to our Question 16, you set out the position as it exists in the Province in the matter of the improvement of the breeds of cattle and you mention the steps that are being taken towards that end. Are you satisfied on the whole with the progress that is being made?—Yes. We are going as fast as we can. I have complaints from our new Live Stock Expert that we cannot give him the trained men he needs. It is difficult to get new men who can take up the work without further training. We cannot get them. At Hissar there is a new man who has been under training for the last six months or so, but that is the only man we have got. The Superintendent at the Hissar Farm acts also as Assistant Superintendent and Live Stock Expert.

41,623. Are you experiencing a very active demand from cultivators for advice and for the provision of bulls of improved strains?—Yes.

41,624. That is the case all along the line?—Yes.

41,625. Public opinion is moving so fast that you are having difficulty in keeping pace with it?—Yes. We have no difficulty here with the zamindar taking up anything that is good.

41,626. Do you think it is likely that a dual purpose animal will be evolved?—I think the amount of milk that can be got from the Hariana cow can certainly be very greatly improved.

Mr. D. Milne.

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41,627. Do you think a dual purpose animal of that sort would find favour with cultivators?—Yes.

41,628. *Do you think* they might breed their own working bullocks and also consume and sell milk and milk products from their cows?—They want a certain amount of milk for their families, and I think they could get it by breeding their own cattle. At the present moment they keep buffaloes for milk.

41,629. Do those members of your rural community who are Mahomedans consume cheese to any important extent?—I really do not know.

41,630. On page 208 you mention an enquiry into the mineral constituents of fodder in this Province which is being carried out; do you know whether that enquiry is being carried out in conjunction with experiments now being undertaken at Bangalore under Dr. Warth?—I know that Dr. Lander, who is in charge of this, and Dr. Warth know about each other's work very well.

41,631. They are in touch?—Yes.

41,632. Are you recommending the making of silage?—Yes.

41,633. Is that spreading?—We are making it spread more or less; we have been carrying out a good many demonstrations in various places in the last couple of years; we have been making silage for many years, but we are really taking it in hand now and pushing it.

41,634. Are cultivators taking it up at all?—I think it is too early to say that.

41,635. Are any cultivators taking it up?—I do not know that they have really started much yet; we are only beginning to push it ourselves.

41,636. Can you tell me of any single cultivator, not a large landlord, who makes silage?—I do not know of a voluntary case, but a case has just been brought to my attention where in the Attock district the Deputy Commissioner has taken a very great interest in the work and has got a lot of cultivators to do it.

41,637. I ask that because wherever we go we are told that silage making offers great hopes of solving to some extent the fodder problem, but we do not discover that it has been taken up very much by cultivators?—It is too new with us; we cannot say that people have taken it up very much voluntarily yet. The work of silage making is being demonstrated.

41,638. *Sir Henry Lawrence*: Have you silage pits on every one of your farms?—I think on every one of the experimental farms; of course, we have a number of smaller farms on which we do not have them.

41,639. *The Chairman*: On page 207 of your note, in answer to Question 16 (*a*), you say: "I regret to say that the Rakh Chandrai grant has been so wanting in success that it is being resumed by Government, but the Montgomery grant is continuing." I do not know whether you would like us to ask you in detail about this failure, or whether the officer more immediately concerned will know more than you. It seems a very regrettable thing that that should have failed?—I think the parties who had the lease were not in agreement amongst themselves; in a nutshell, that is what it comes to; in view of the discord among the partners I do not think it could possibly have succeeded.

41,640. *Mr. Barron*: Was not the land used for cotton and other crops, and was not the dairy a mere blind to secure the land?—People make what money they can out of their lands, but still I think as a dairy it could not have succeeded with these people quarrelling in the way they were.

41,641. *The Chairman*: Do you regard the failure of this endeavour as a serious set-back to dairying in the Province?—I am just putting forward

another scheme; I am making a proposal to take over this land and put *gowalas* (dairymen) as tenants on it, each having a square of land of 25 acres. I propose to make them keep cows which will give a certain amount of milk, charge them a small cash rent, and make them bring all their cows in the morning and evening to a central shed to be milked under the supervision of an officer of the Agricultural Department. We will see that it is brought to Lahore and is available for sale in a clean and proper way. I think that is the best way to use this land at the present moment. There is some idea of canal irrigation supplies being taken from it; in that case I think nothing could be done. There is a tube well already on the farm, but the water is so salt that the tenants never used it.

41,642. How about legislation or regulations in the urban area of Lahore designed to protect the consumer in the matter of milk?—They have Milk Inspectors going round, and I am informed that samples of milk are analysed and people are dealt with; that is what the Health Department told me the other day.

41,643. In your note of evidence you say at the present moment the demand is being met by a number of *gowalas* who carry on their business in the most insanitary manner?—Yes.

41,644. Are they likely to be able to sell their milk to Lahore if there is an efficient method of inspection?—I am afraid the facilities for inspection are not very good.

41,645. Quite apart from protecting the public, it would assist progressive dairying a great deal if there was a sufficient examination of all milk sold?—Yes.

41,646. It would stop undercutting in prices by those who sell adulterated and dirty milk?—Yes.

41,647. Have you represented that to Government or to the local authority?—My proposal with regard to this dairy grant is that we should get these people to come to the farm, and that we should give them land to grow their fodder themselves and keep their cattle; the cows would then be milked under our supervision and sent to Lahore.

41,648. Yes, you have made that plain, but what I am asking is: are you taking steps to bring to the notice of the local authority the desirability of framing new rules, if they are required, or of enforcing existing rules, with regard to purity of milk supply?—I think it is a matter for the Medical Officer of Health; I agree it is also a matter of importance to us.

41,649. In answer to Question 17 (*b*), you deal with the question of extending fruit growing in the Province. Have you considered the possibility of extending the fruit market?—We have just recently, only a few months ago, got our Fruit Expert, and this is one of the things that he is going to try and take up. One thing that the people in this Province are complaining very bitterly about is not getting the stock they think they were buying, and finding three or four years later that it is some other variety; so we are trying to organise private nurseries; we are also trying to get a number of the bigger fruit growers to market their fruits together, have them graded and sorted, and that sort of thing.

41,650. What range of fruits are you thinking of?—Fruits like apples and pears from the Kulu Valley, and oranges, limes, &c., from the plains. Of course, the important thing in the plains is the citrus tribe of fruits.

41,651. They can be marketed at a distance without cold storage?—Yes; peaches are rather difficult to carry.

41,652. Do they require cold storage?—The skin is so very tender that they get bruised very easily, and then they begin to rot.

41,653. Is the system of packing in existence satisfactory?—There is practically no packing; peaches are not very much marketed; the plains are too hot for them; they can only be grown at the base of the hills. I think Mr. Howard did a good deal of work in connection with the packing of peaches in Quetta; he was able to send them as far down as Lahore and even down to Pusa properly packed, but that sort of packing is rather expensive.

41,654. Would you regard investigation of the method of packing and so on as part of the duty of the officer recently appointed?—Yes, he will take that up. As a matter of fact, I have just put in for a Second Fruit Specialist in the Budget which is coming before the Legislative Council now.

41,655. Is there any reason why this part of India should not capture an extensive portion of the trade in imported apples?—The plains of the Punjab are too hot for apples; they are not of good quality.

41,656. *Sir Ganga Ram*: You have just engaged a Fruit Specialist, have you not?—Yes, but he is flooded with requests for advice from all over the Province; we want an army of these people, not one or two.

41,657. *The Chairman*: It is a fact, is it not, that if you could substantially extend the amount of fruit growing, you would be helping a type of countryman who is very much in need of assistance at the moment?—Yes, very much.

41,658. Who is dealing with vegetables?—We have not really started with a specialist on that work.

41,659. Do you think that is a hopeful field?—Government has set aside an area of land in the Nili Bar for vegetable grants and we have just taken two of them over. There are so many things pressing to be done that we cannot do them all at once. We had to delay dealing with vegetables for a couple of years in our scheme of development; we could not do everything in the first year.

41,660. You did not say anything in answer to our Question 19 on Forests; have you important forest areas in this Province?—Yes.

41,661. Do they touch agricultural interest in the matter of grazing?—They do.

41,662. Are you satisfied with the degree of touch between your own and the Forestry Department?—I think so; I do not think there is anything to complain of.

41,663. *Sir Henry Lawrence*: Have you got forests in the plains?—Yes

41,664. *The Chairman*: Are you considering the advisability of wood for fuel in the new canal colonies?—I think that is a Forest Department question.

41,665. But I think it is also an agricultural question if I may say so, because on the agricultural side it touches the question of cowdung burning?—It does.

41,666. Have you conferred with the Forest Department at all with regard to establishing forest areas?—No, I have not.

41,667. Would you attach importance to the burning of cowdung and its effect upon the fertility of soil?—It is a very interesting problem; I think it is a problem we should try to thrash out as to what exactly is the economic loss.

41,668. I ask that because I judge from one or two remarks in your note that you think it has been exaggerated by some people?—I do not think the loss is quite as great as one might think. There are one or two reasons for that opinion; one is that the moment you put organic matter into the soil in the form of green manure you get a most excellent result straight away. Another point is that if you put phosphates and

potash into the soil you do not get much increase in yield. It is not so much a question of these mineral constituents as long as there is the organic material. Then with regard to replacing nitrogen in the soil I think it is replaced far more quickly here than it is in colder countries.

41,669. *Professor Gangulee*: Is it your view then that farmyard manure could be replaced by green manure?—I want the whole question thrashed out with a view to ascertaining what exactly is the situation. I do not think it is quite what appears on the surface to the casual observer; that is my point.

41,670. *The Chairman*: From the cultivator's angle it may be that if he pays for his fuel he will save less than he would make by employing the cowdung available as manure; that is your point, is not it?—I would like this question thrashed out; I am not at all happy about it.

41,671. To go back to forests again, do you keep a fund for reserve against fodder famine in this Province?—That is kept by the Financial Commissioner.

41,672. Do you control that?—No, the Financial Commissioner does.

Mr. Barron: There is no fund for reserves against fodder famine.

41,673. *The Chairman*: Have you had a fodder famine recently?—We have had to give relief.

41,674. Have you studied at all the possibility of making hay in forest areas?—No.

41,675. You have not considered that?—No.

41,676. Have you interested yourself at all in the question of reclaiming and protecting the soil in forest ravine lands where erosion is going on?—I have not studied it, but certainly it is a good thing.

41,677. Is that a direction in which the Agricultural Department and the Forestry Department come very close to each other?—Yes.

41,678. Is erosion going on in this Province?—Yes, in parts of it.

41,679. But you have not assessed the extent of the damage going on?—No.

41,680. Have you heard at all of the successful experiments being carried out in other Provinces in this direction?—I do not know that I have heard much about that except generally.

41,681. Turning to the question of Marketing, I should like to ask you first whether we may expect any more information than has already been presented to us? I think you have decided to conduct a survey of marketing of certain crops. When do you think you will get your results?—Perhaps you are referring to the Indian Central Cotton Committee's proposal. There is another one referred to on page 219 of the note, the Board of Economic Enquiry.

41,682. Do you know at all when we may expect the results of that enquiry?—The Board of Economic Enquiry has not been finally decided upon; it is still in the embryo stage.

41,683. I am asking you whether it is your intention to put up anything more in the way of information so that we may know where we stand?—With regard to financing and marketing of cotton, that will be available; but with regard to the other one we are still considering it.

41,684. Would you agree that very little is known about marketing as a whole?—I think it is very necessary to receive more information. I should very much like these intensive enquiries to be carried out and to get definite information.

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41,685. It is very little use providing the cultivator with theories if he is not going to get advantage?—I do not see any reason why we should not have agriculturists as members of the marketing committee.

41,686. You want them to control the market?—They should have a voice in the control of the market.

41,687. Can you find in this Province qualified cultivators really who would have the time and skill to represent their own interests on the marketing committees?—Yes.

41,688. In cases where you could not find such cultivators, would you agree that the Agricultural Department through a representative is the proper body to watch the cultivators' interest?—I think that will be quite useful, yes.

41,689. Have you ever considered the feasibility of proceeding on that line?—I think that we will be able to get cultivators in most places who could take their place on the committees.

41,690. Broadly speaking you do feel that the expense on these enquiries is worth while?—Yes, very much so.

41,691. You also attach importance to these enquiries in that they educate your officers?—Yes. They are very valuable from that point of view.

41,692. They are also valuable in that they enable you to disabuse the public mind of prejudice where in fact the prejudice exists?—Yes.

41,693. You have introduced in your note of evidence a copy of the Bill of 24th January, 1927, entitled "The Bombay Cotton Markets Bill," Bill No. III of 1927. Is there a proposal to introduce some such Bill in the Punjab?—No, not at present.

41,694. You would like to see it introduced?—Yes, but not for cotton alone but for general marketing.

41,695. Would you care to be taken in any detail into the matter of grain elevators? Is that a problem which you have considered?—I do not know very much about them.

41,696. Have you formed any view as to whether the moment has come for taking a plunge, because it cannot be taken in small batches?—That is the difficulty about the system; you have got to take the plunge. I think that more enquiry is needed. We have had an elevator at Lyallpur for some years. The trouble is that buyers at the present moment have got machinery to carry on their business and leave the whole thing standing. That is the danger.

41,697. You think you ought to be quite certain that they would come in?—Yes.

41,698. Do you think that the railway companies would be inclined to come in?—Yes, I think so.

41,699. Why do you think so?—From the attitude of the railway officials, as far as I can see.

41,700. Is there much difficulty from the point of view of the railways in handling the grain traffic?—I do not know that there is very great difficulty. They also want to try and stop a lot of cross traffic.

41,701. Are you in touch at all with the enquiry carried on on behalf of the North Western Railway?—The last I knew of this was a meeting at Simla. A report has just come out.

41,702. You have not seen that?—I have just glanced at it yesterday.

41,703. It has been suggested to the Commission that if a system of pooling were to be adopted in the case of the elevators, the cultivator would

be shy of using the elevator because to him the notion of his own grain losing its own identity would be strange and he might be alarmed. What do you think about that?—I think that that will happen to a certain extent; but it might be overcome in time, I think. At the same time one cannot make too much of this because the milling outturn already differs in different places. I do not think, for example, that probably the outturn of wheat in a comparatively humid atmosphere such as Rawalpindi would be the same as that in Lyallpur. But I think the railway would be able to save a good deal of haulage. I think every endeavour should be made to get this elevator system started; but the danger is that the trade at the present moment has the facilities to carry on without it.

41,704. Broadly speaking, would you agree that you would have to found the case for embarking on the scheme now on the internal consumption trade, and not on the external trade?—Certainly; it must be fitted for the internal trade; external trade is too uncertain.

41,705. On page 220 you are dealing with the effect of the American cotton upon the prices in the market and you point out how important it is that the prices of long staple cotton should be maintained in order that the long staple cotton may continue to be grown. Quite apart from this question of the effect of adulteration on the prices, is there not a tendency in the present movement of world prices for the price margin between long export staple cotton to be narrowed for that to be eliminated, having regard to the high yield per acre of the shorter staple varieties?—The bringing down of the prices narrows the margin. Two years ago there was something like Rs.6 or 8 difference between the longer and shorter staples, but now it is probably something like As 12.

41,706. Do you think, provided that the purity and so the reputation of a long staple Punjab American cotton can be maintained, it is likely there will be a sufficient difference in the prices to ensure a reasonable amount of long staple being grown; is that your view?—Yes.

41,707. Is that because you think it is likely to bring prosperity in the future?—I do not see why it should not; it has brought tremendous prosperity in the past.

41,708. Just a question or two on this matter of co-operation in answer to our Question 22. Are you satisfied with the degree of touch existing between your own and the Co-operative Department?—Yes, I think so.

41,709. Do you feel that you are making the fullest use of the co-operative organisation in this Province in the matter of propaganda, distribution of seed, agricultural education and so on?—Yes. Of course there is a limit to the amount of propaganda that the Co-operative Department can do. I think that the men must have a training in agriculture before they can take on the work of propaganda. Otherwise they are apt to go wrong. There are many things in which the Co-operative Department might go wrong. It would be a sound thing for as many men as possible in the Co-operative Department who intend to deal with agriculture, to have a training in agriculture.

41,710. Apart from the direct agricultural propaganda which may be carried out by the Co-operative Societies, do you find that co-operators are more susceptible to your propaganda than those who are not co-operators?—I do not think that we have any difficulty with either; we are flooded with requests from all round.

41,711. I want to know whether you have had any indications that the educative effect of co-operation renders a man more receptive?—I think it is all to the good.

41,712. Are you satisfied with these better farming societies?—They have just been started and it is a bit too early to say anything.

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41,713. Are you going to help them in their work?—When they get to a certain area, say about 2,000 acres, the Agricultural Department then places a *mukaddam* in that area.

41,714. I notice that there are two stages, the first being that they earn the presence of one of your officers in the district, and the second that they secure a monopoly of his time?—And there is a third stage in which an Agricultural Assistant is specially deputed for such an area.

41,715. It that the existing arrangement?—Yes.

41,716. *Professor Gangulee*: How far have you gone in this direction?—We have not yet got to the third stage; we have got to the second so far.

41,717. *The Chairman*: Do you find that there is competition between the Agricultural Department and the Co-operative Department at any point or points?—I do not think there should be, nor have I been able to put my finger on anything where there has been competition.

41,718. Take for instance a better farming society, I do not know the range of their activities in detail, but I take it that better cultivation for sowing of improved varieties and so on would be the burden of their song?—It is all done with the advice of the Agricultural Department, so that there can be no friction.

41,719. Do you think the Co-operative Department has succeeded in improving the prospects of cultivators in the *barani* districts?—I think so.

41,720. And they have been as active in the *barani* areas as they have been in the irrigated areas, is that so?—Yes.

41,721. Do you find that complaints from primary societies or from better farming societies as to the lack of, let us say, propaganda, or the need for some particular piece of crop research come to you through the Co-operative Department?—We have not had any complaint like that yet.

41,722. Would you welcome them if they came?—Certainly.

41,723. You do not give us any views as to general education and its bearing upon agriculture. Have you anything to say about primary education in the Province? Is that satisfactory from your point of view?—I have left that to the Director of Public Instruction.

41,724. I should like to ask you, for instance, whether it is your experience that literacy renders a cultivator more susceptible to new ideas?—I think it certainly would, in fact I am sure that it would. Education always has that effect everywhere.

41,725. Have you interested yourself in the problem of adult education at all?—No.

41,726. Do the women folk take any active part in farming in this Province? Is it the custom, do you know?—In the south-eastern side you see the women in the fields very often.

41,727. *Sir Henry Lawrence*: Anywhere else?—Yes, you can see them all over the Province in work such as cotton picking. I think the women are almost as active as the men, in the Rohtak and Karnal districts.

41,728. *The Chairman*: I take it you envisage a very considerable extension in the activities of your Department in the next fifteen or twenty years?—Yes. Very much so.

41,729. Do you see any danger of over centralisation?—Decentralisation is a thing we have got to do now; and we have started off by giving Deputy Directors more powers. We must do it, otherwise the machine will not hold together.

41,730. *Sir James MacKenna*: With reference to the question of the subordination of the Veterinary Department to the Director of Agriculture, are you aware that this is the only Province in which that arrangement still exists?—Yes.

41,731. And would it not be in accord with your desire for decentralisation which you have just expressed to the Chairman to separate them?—No; I think it would give room for discord where it is most important to have concord.

41,732. You do not think that the present state of affairs will contribute more to discord rather than to concord?—No, and I have mentioned in my note a number of cases in support of this.

41,733. Is it not a fact that this demand never arose so long as Indian Civil Servants were Directors?—But you have just told me that in every other Province this arrangement does not exist.

41,734. That is since the Directors of Agriculture have been recruited from the Agricultural Department. You do not think that a separate recognised professional service such as the Veterinary Department which is recruited through one avenue, namely the Royal College of Veterinary Surgeons, has a natural grievance in being subordinated to a younger Service such as the Department of Agriculture to which recruitment is made from scientists of any kind namely, Botanists, Chemists, Agriculturists, Entomologists, &c.?—I do not look at the question in that way at all. The question is whether it is for the good of the country or not? I myself think that something should be done to give capable officers an opportunity of getting their value as time goes on. We have had one case just now where a man has been given an allowance. I think that if a capable officer in any of the special branches of the Agricultural Department including Veterinary has not been made Director of Agriculture in a Province owing to the fact that he did not have the general education and general training which a Director of Agriculture might be expected to have, that officer should be given an allowance to make up for it to enable him to continue in a job in which perhaps he has specialised for many years. I must say that I sympathise with the men; I have no grievance against them, but I do think that the way to look at the question is this, namely, whether it is for the good of the country, or whether it is not.

41,735. Do you not think that, with the assistance of a Financial (Development) Commissioner, there would be no necessity to subordinate the Veterinary Department to the Agricultural Department? Would veterinary matters not go straight to the Financial Commissioner?—I have dealt with that in my note and have given my reasons for my view.

41,736. What are your views with regard to cattle breeding? Do you think that Animal Husbandry should be under the Agricultural Department or under the Veterinary Department?—I think it should be under the Agricultural Department.

41,737. What are your reasons for that?—The Veterinary officer's training is with regard to diseases of animals; the training of the general agriculturist in the way of animal husbandry is carried out from quite a different angle altogether. He has to see what the points are of an animal for milk, what sort of implements should be used, how far the animals are fitted to work them and for how long, what sort of feeding they require, and how that can be kept up; also things of a similar nature. The agriculturist approaches the problem from an entirely different angle from that which the Veterinary Officer would take.

41,738. So that animal husbandry in your opinion should be under the Director of Agriculture?—Yes.

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41,739. I gathered from your answers to the Chairman that you are not very much in favour of cesses; that is to say, imposing extra taxes with a view to increasing the revenues available for agricultural development. In the particular case of sugar, as you know, a considerable import duty is levied, which goes to the Government of India annually. Would you be in favour of earmarking a portion of that import duty for research in sugar or other agricultural problems of the country?—I think myself that that would be a very good thing.

41,740. With regard to your *barani* areas, are there any districts in the Province which have not as yet been touched by the operations of your department?—We have just touched all the districts now. One of the last districts I think was Attock; of course, I am not including Simla, as we have not yet touched that district, except in the matter of potatoes.

41,741. Pusa No. 4 is a variety of wheat which has done pretty well in the United Provinces and also up in the Frontier Province. Have you had any success with that in your *barani* tracts?—It has not done well.

41,742 What area have you got under Punjab 11 now?—I think about 625,000 acres.

41,743. What is the origin of that wheat?—The year before I arrived here Mr Howard came to the Punjab and separated some 25 types of wheat which he found on the agricultural farm at Lyallpur. He took them with him to Pusa, and when I arrived in 1907 he handed back to me a small quantity of each of these 25 types. He had them tested by Mr. Humphreys, a miller in Britain, and gave me a statement in which the wheats were classified. I will give you a copy of that statement later. In that he gave me milling results. The question then was, which of these wheats was of most use to the Punjab? I devised a system of test plots inter-stripped with a standard variety, and came to certain conclusions about the agricultural values of these wheats. They were also tested on the agricultural farm at Lyallpur. We came to the conclusion that Punjab was the best of the lot instead of one of the worst, as the information given me by Mr. Howard seems to indicate.

41,744. What about your cotton policy? Do you think it is desirable to go on with American or devote more attention to your indigenous varieties?—I have always held that our duty is to give the cultivator what he asks for. When I started work on cotton, I took both the American and the *deshi* cottons in hand, but the results obtained from the American cottons were so very much beter than from the *deshis* that the cultivators asked for the Americans. If the prices go on falling and the zamindar does not get a better return from the Americans than from the *deshis*, he will ask for *deshis*.

41,745. You cannot be continually chopping and changing?—I am strongly against interfering with the freedom of the zamindar. I find he is a very sensible man, and I think it is wrong to put too much pressure on him. If we can help him in any way we will do so.

41,746. I was thinking more of your research policy. Do you devote equal attention to Americans and *deshis*, or are you going to concentrate on one or the other?—We intend to pay attention to both. It would be wrong to neglect the longer staple cotton which has done so well over an average of years, and, if prices remain fairly good, that cotton will continue to be useful. I have a great objection to forcing the zamindar to take up a particular wheat or a particular cotton. My idea is to give him what he wants.

41,747. In Bombay I heard various criticisms of 4 F. It was said that it had deteriorated and was very poor nowadays. Is that a fair criticism?—A crop like cotton cannot be as pure as it was when first put out, but there is a good deal of wrong opinion with regard to 4 F. We have just

had a very bad year and the fibre is very poor. We had similar bad years in 1919 and in 1921, and we were told then that 4 F had deteriorated and that we must start again. That was proved to be entirely wrong by the fact that the seed from that cotton in 1922 gave as good a cotton fibre as we had in 1920 or 1918 thus showing that crossing had not taken place to the extent that was said.

41,748. *Sir Thomas Middleton*: Is there any crossing at all between the Americans and *deshis*?—No. If that occurred we could not have had those two varieties as pure as they are now.

41,749. *Sir James MacKenna*: Have you gone into the question of sugar factories in the Province?—Yes. We have just had Mr. Noel Deerr looking into the question; he expects to get about as much sugar with an up-to-date manufacturing plant as we get of *gur* at the present moment. He hopes to get 8·8 per cent. of sugar instead of the 9·7 per cent. of *gur* got by present methods. One of the points I am disturbed about is this. Mr. Noel Deerr wants the working season to be four months, which means that if you start crushing cane in the middle of December that will lead you into the middle of April. I do not think that cane will stand safely in the field until the middle of April. You saw in Jullundur field after field of cane which had been affected by frost, and my Deputy Directors report now that from 5 to 80 per cent. of damage to standing canes has been done by frost this year. If you are going to have that kind of thing, it would not be very safe to put down a sugar plant costing 7½ lakhs of rupees.

41,750. You have a very large number of big estates in this Province?—Yes.

41,751. Mr. Roberts is manager of one or two. Have you found that they have had much influence on the general agriculture of the neighbourhood?—Yes. They have done a great deal of good. The results which Mr. Roberts gets make his neighbours endeavour to get the same.

41,752. You are in favour of the extension of that policy in the Punjab?—Yes, if we can get the right men to do it; but we cannot always get them.

41,753. *Professor Gangulee*: I take it you have known this Province for twenty years; what definite changes in agricultural practice have you noticed?—The use of a number of improved *deshi* implements and imported implements; I think improved cultivation is improving the crop yields in the districts where we have been at work for a time.

41,754. Do the same remarks apply to the *barani* tract?—Yes, but we have not been at work so long there. For instance Mr. Robert's bar harrow is used in places. I think a good deal has been done in the way of teaching people how to conserve moisture by keeping the surface of the soil properly harrowed and so on. All our Deputy Directors are keen on that now and I think their work has had an effect; but it is not an easy thing to measure.

41,755. Has the standard of living risen?—My impression is that it has.

41,756. Your department is one of the departments which are intimately concerned with the development of rural areas. You have already answered this question, but I want to get a little more information from you. To what extent does co-operation exist between the various departments in the Province?—We all pull along with our work, and I do not think we disagree in any way.

41,757. The point is, do you appreciate that the problem of rural life is really a problem which is to be faced as a whole?—That is true.

41,758. It must not be dealt with piecemeal?—No.

41,759. I want to know whether the various departments have realised that the rural problem is to be dealt with as a whole and not piecemeal,

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and are they trying to deal with it as a whole?—I think Government is tackling it as a whole, and I think each department plays its part.

41,760. Is there any co-ordinating agency in the Province?—Government is the co-ordinating agency

41,761. You have two Financial Commissioners?—Yes.

41,762. They are co-ordinating agencies?—Yes; Government is really the co-ordinating agency.

41,763. Have you any Provincial Development Board?—No, I do not think so.

41,764. *Mr. Barron*: Have you seen last Friday's Gazette?—No. I have been on tour.

The Provincial Board of Development was gazetted last Friday.

41,765. *Professor Gangulee*: On page 190 you say you feel the need of a special propagandist officer in the Agriculture Department to deal with propaganda. From what we have been able to gather the co-operative movement appears to be well rooted in this Province. Have you explored the possibility of utilising that movement for purposes of propaganda?—The propagandist officer is needed for another purpose. We publish a little paper called *Seasonal Notes;* a number of people write for that paper. We have very little time to look after these matters, to push the paper, to see that the articles written are correct and so on. We also have to make hundreds of lantern slides; to develop the programme for the cinema motor car that we are starting to tour the Province, somebody must look after the programme of lectures required in those connections, and there is also a great deal of other publication work going on the Agriculture Department.

41,766. You really mean that you require a publicity officer?—This officer will have to do publicity work; he will have to co-ordinate our work in connection with publicity. My idea also is to put him in charge of the library at Lyallpur, where a man is wanted very badly.

41,767. It is not quite clear in my mind what organization you have for demonstration of your results to the cultivators?—As far as demonstration of botanical work and crops is concerned it begins on the Botanist's own plots; you find farmers coming round, having a look at the different plots, and even before one is very certain oneself as to which variety is the best you will find some of these shrewd old men coming round and saying: "That is the variety that is going to be the best to us." By that means a certain amount of demonstration work is carried out. That particular variety is then grown on the experimental farm at Lyallpur; then the Professor of Agriculture has it tested on a bigger scale to see that it is going to do well not only on small plots, but under actual agricultural conditions. Varieties which may be successful on small plots are not always successful under actual agricultural conditions; for example, Punjab No. 9 wheat in good land with better cultivation has yielded better than No. 11 fairly consistently, but when it was subjected to the rough and tumble of the zamindars cultivation it was found to require a little more water, better land and a little better attention than the ordinary zamindar with his standard of cultivation did in fact give it, and so the results were not as good with him. After the stage of being grown on the experimental plots on the farm at Lyallpur the Professor of Agriculture gives it to his tenants on the farm, and they farm it. The results there give some indication of what it is going to do when grown by the ordinary farmer in the district. It then goes to the seed farms and demonstration farms, and is gradually spread to cultivators in that way. The same thing is done with regard to agricultural implements and methods of cultivation. The improvement is dealt with first on the experimental farm, and from there it gradually works out into the district.

41,768. When you carry on demonstrations on the cultivator's own land, what arrangements do you make with the cultivator? Do you guarantee him against loss?—I did to begin with in the case of potatoes in the Simla hills; I used to guarantee to make up to the cultivator any loss that he might suffer. As a matter of fact I never had to pay anything. We make no guarantee of that sort now to the zamindar. By the time he had seen a method of cultivation, an implement, a seed or whatever it may be, go through several of these stages, he is anxious to try it for himself. We have no trouble in getting cultivators to take things up; they are calling for more demonstration plots, but my men can only take and look after a certain number of these.

41,769. Have you adequate staff to supervise these 300 or 400 plots that you have?—That is all the plots we can supervise; that is the limit at present.

41,770. References have been made to better farming societies; how do these societies compare with your demonstration farms in matters of crop production?—The newer ones have not had time to show what can be done yet. Mr. Calvert was referring a minute ago to an old one at Chilianwala. They do not get the same attention as we give to our own farms where there is a man standing over the crops all the time; but they are certainly an improvement on the methods of the zemindars who get no supervision.

41,771. You have referred to post-graduate training in Lyallpur. Does the same teacher who conducts the ordinary teaching for the B.Sc. course conduct the post-graduate teaching?—The M.Sc. is a research degree, and the particular piece of research is supervised by the head of the section.

41,772. And they are asked to submit a thesis?—Yes.

41,773. And that thesis is published?—We have not yet got a man through the whole period; we have only just started that degree.

41,774. You knew this Province at a time when the Lyallpur Agricultural College was not affiliated to the University, and you also know it now that it is affiliated?—Yes.

41,775. What changes do you find that affiliation has brought in?—Affiliation gives the College a status; I think affiliation is very helpful. We have no difficulties about that at all. It was feared at one time that perhaps it might hamper our movements, but I have not found it so; it has always been helpful.

41,776. The number of applications has increased?—I have given a table of the numbers of applicants in my part of the memorandum. To what the increase may be ascribed is a matter of opinion.

41,777. Out of 140 applicants last year you have admitted only 64. That is the maximum capacity of your College?—In fact it is beyond the capacity. We always reckon that a number of students will fall out for some reason or other. We generally find that a few do fall off between the time we select them and a little later.

41,778. *Sir Henry Lawrence*: What is the total number?—260 in the Lyallpur Agricultural College. I can give you the exact figures:—

First year	63	students.
Second year	34	,,
Leaving certificate class	23	,,
Third year	22	,,
Fourth year	41	,,
M.Sc.	1	
Casual student	1	
Teachers' class	32	
Vernacular	43	
Total	260	

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41,779. *Professor Gangulee*: Have you any other institution in the Province where they offer a B.Sc. degree in Agriculture?—There is no other institute for the B.Sc. degree.

41,780. With regard to the B.Sc. students going to Europe, do you think they are sufficiently equipped to be benefited by their visits to Europe?—I am sure of it. We have one student who came back and told me that on the botany he got at the Lyallpur College he took the B.Sc. degree of the London University without taking the course in that subject there.

41,781. You emphasise, on the practical side of agriculture, the need for practical education. Do you emphasise the economic side of agricultural practice in your teaching?—Yes, and I am very keen that that should be strong.

41,782. Are the students trained in keeping farm costings?—They get instruction in book-keeping and know how to keep costings, but on their plots they do not actually keep costings.

41,783. They are given a certain number of plots?—Yes.

41,784. But they do not keep costings of all farm operations carried on the plot?—I do not think so.

41,785. Do you take them out to study the marketing conditions of farm produce?—Yes, they are taken to any place of interest in the Province.

41,786. Do you follow any particular text-book in agricultural economics or base your teaching on the information that you gather?—There are certain books; you will find them in the University Calendar, together with the whole syllabus of instruction.

41,787. One or two points about your research work. It is held by some that our provincial departments should concentrate more on demonstration and propaganda and less on research. Do you agree with that view?—I suppose the standards will differ in different Provinces. My own view is that we must go as far ahead with research as we can; the farmers will take things up as rapidly as we can ever produce them.

41,788. You have one Economic Botanist, a Cerealist and a Fodder Specialist. I suppose the Cerealist is doing work on cereals and the Fodder Specialist on fodder. What are then the duties of the Economic Botanist?—There is no Economic Botanist now. His work has been split up. I was the Economic Botanist, but the work has been split up now among the Cerealist and other specialists.

41,789. Have you been able to carry on any research on such important and intricate problem as, for example, the relation of water to the soil?—A certain amount has been done on water requirements of crops by the Professor of Agriculture. Mr. Roberts will be able to tell you about that. But we had a scheme for a hydraulic station in the Punjab and that I personally would like very much to see started to enable us to investigate such problems thoroughly.

41,790. The point I wished to raise in regard to this question of the relation of water to soils is this: It is a question that affects more than one Province. Do you think such a problem could be successfully tackled by the Central Government?—The original proposal was the Central Government working in conjunction with the Punjab Government.

41,791. What happened to that proposal?—I do not quite know; it seems to have fizzled out. I have 200 acres of land near Lyallpur College now available for the work, but I have not got the staff sanctioned, and we have not yet started it.

41,792. There is another problem, the problem of alkaline land, which is also inter-Provincial, is it not?—Yes.

41,793. That also should be taken up by a central organisation; do you not think so?—We will be very glad if anybody can help us.

41,794. These are some of the problems that affect more than one Province?—But in a way the water requirements of a soil would be affected a very great deal by the dryness or otherwise of the climate and also the soils might be different in their constituents, and so on; I have no doubt that a lot of useful work could be done on that subject.

41,795. An interesting piece of work, I understand, has been started by an Advisory Committee consisting of the Director of Agriculture in the Punjab, the Imperial Agriculturist and the Agricultural Chemist, to investigate the possibilities of the reclamation of *barn* land. What happened to that work?—It was started by the Agricultural Department with the Agricultural Chemist in charge, but is now under that Committee. It is going on still.

41,796. You obtain assistance from Pusa?—Yes. We have to hold our annual meeting some time next month. We get advice from the Agriculturist at Pusa as a member of that Committee.

41,797. With regard to fertilisers you say that the application of nitrogen did not have the outstanding effects that some people might expect, and at the same time we find the quantity of nitrate of soda sold in the year 1925 rose from 976 maunds to 3,659 maunds?—Yes.

41,798. That obviously shows that it has produced some effect?—Will it continue? That is the question. I do not think it has gone on long enough for people to have any settled information about this. You will probably find great differences of opinion on the point; whether it is paying is a question.

41,799. I am not referring to the economic aspect; but I would like to know its effect on the soil treated with nitrate of soda?—I do not think it has gone on long enough to say very much about it yet.

41,800. Could you tell us what is the limiting factor of your soils, as far as the mineral constituencies such as nitrogen, phosphates, and so on, are concerned?—As the case stands at present it will probably be nitrogen. The addition of organic matter stimulates the bacteria which increase the nitrogen. Under the present systems of cropping and climate this seems to carry us round; but near towns where more intensive cropping is carried on you have a great deal of manuring going on.

41,801. You attach a great deal of importance to the activities of these organisms in the soil?—Yes.

41,802. Have you made any experiments to determine the loss of nitrate in the soil?—Yes. Dr. Lander will be able to tell you about this; he has published a bulletin on the subject.

41,803. I ask this specially because in Pusa as well as in Nagpur they are working at this particular problem of the loss of nitrate; are you in touch with these investigations?—I do not know that I have seen the latest information about it.

41,804. What is your organisation for seed distribution?—After our experimental farm work our seeds are grown by our own seed farms, or on the big grantee farms, and so on. The Deputy Directors purchase those seeds from these farms at harvest and hand them over to agents who sell them from our seed depots. These agents get a certain small percentage of profit, a couple of annas or something like that per maund for their work when they sell them to the zamindars.

41,805. Do you guarantee their purity and also their germination?—There is no written guarantee. It is the Departmental seed. The Deputy

Director himself goes and selects the seed, and it is kept pure. There is no difficulty whatever about it.

41,806. You refer to the mixing of cotton. Is there a Cotton Ginning and Pressing Factories Act in operation here?—Yes.

41,807. That does not safeguard the quality of cotton, does it?—It helps us to know where mixing has taken place. Under this Act every bale of cotton has got to be stamped with a serial number, and a number which is the mark of the pressing factory from which it comes, so that if a bale of cotton goes to a spinning mill the spinner can discover from what ginning and pressing factory that bale has come. To that extent it is helpful, that is to say, you can trace back bad bales to the factory of origin.

41,808. Would you like to amend that Act? Have you any definite suggestions to make in order to improve the situation as regards mixing?—I have made suggestions quite a number of times. I would like to see cotton sold on a basis of quality just as is done in the case of many other things nowadays. I would like to see people send a sample to a testing house, get a spinning test made, and sell it on a certificate of the test.

41,809. At Hissar we were told that cattle breeding does not pay. We would like to know what your view is?—I do not think it does pay unless the farmers have a pretty large area of grass land watered by rainfall. I think that crop growing pays much better. Wherever a man can grow a crop he does so.

41,810. Is there any system of granting land to cultivators who are willing to go in for cattle breeding?—Yes.

41,811. To what extent is that system popular?—We have the big cattle-breeding farms about which Mr. Branford told you yesterday; there are about half a dozen of these big farms.

41,812. The idea there, I take it, is to make cattle breeding pay?—These people get land on easy terms in order that they may be able to improve the breed of cattle; they would not get the land on the terms that they do if that were not the case.

41,813. Do you offer subsidies for fodder growing?—No.

41,814. *Mr. Roberts*: Remission?—Yes, the canal water rate for fodder is Rs.2 per acre. Cattle breeding is encouraged to that extent. It involved Government in a reduction of income from canal water to the extent of about 16 lakhs of rupees, when the reduction in water rate from Rs.3 to Rs.2 per acre was made.

41,815. *Professor Gangulee*: What is your view about the Board of Agriculture?—I think it is a very useful thing indeed.

41,816. *Mr. Calvert*: On the question of the reduced water rate for fodder, is not Rs.2 per acre actually less than the cost of landing the water there?—You want an irrigation man to be able to go into that question.

41,817. At the Lyallpur College do the students pay fees?—Yes.

41,818. What are the fees per year for the B.Sc. course?—The tuition fee for the first and second year classes for all Punjab students, including scholarship holders, is Rs.18 per quarter; for all other students coming from the Indian States and other Provinces it is Rs.27 per quarter. It costs a boy roughly from Rs.40 to Rs.45 per month at the College.

41,819. What proportion does the fee bear to the total cost of providing education to the student?—I have not got the figures, and it is not easy for us to work them out. We have got to supply a figure annually to the Director of Public Instruction, but as the instructors or teachers are

also engaged on research work it is not very easy to disentangle the two things.

41,820. In this Province there is an actual demand for agricultural education on payment of fees?—Yes.

41,821. Has anything been done in the Punjab with synthetic manures. I mean the ordinary rubbish which is fermented with urine?—Yes, we are demonstrating the collecting of all sorts of rubbish in a manure pit.

41,822. Has that proved successful in this dry climate?—Yes, wherever you put organic matter on to the soil you always get a good result.

41,823. On this question of cropping research, do you think that the work done on crops in the Punjab bears due proportion to the value of the crops in the Punjab? Wheat, for instance, is about 43 per cent., and cotton is 10 per cent. of the total production. Would you say you put four times as much research work into wheat as into cotton?—I do not suppose one does. When I started as Economic Botanist to the Province on this work I was asked to confine my attention to three things: one was to try to get my own section of the College arranged in such a way that a man trained there would be a better farmer when he passed through it than when he entered it; the second was to try to improve the wheat crop; and the third was to try to improve the cotton crop. I do not think we went into spending time in proportion to the value of the crop. Wheats and cottons are two valuable crops, and we do what we can for both of them with the staff that we have available.

41,824. Has as much work been done on gram?—Very little. I made a collection of all the types of gram I could find in the Province, and I have sown these pure types alongside one another with a view to seeing which is the best from a farmer's point of view in an average season. But gram is a very tricky crop to grow because the results are so variable; it is not nearly as steady a crop as wheat is. You will find the outturns fluctuating up and down annually, with the result that it is not easy to get down to anything definite with gram. In my opinion gram wants more attention. I started my work as Botanist, confining myself to the three things which I was told to concentrate on and on the advice of the late Sir James Wilson refrained from dissipating my energies over a vast number of things. After all, one can only take up a few problems and deal with them seriously, and rightly or wrongly we stuck to our wheat and cotton crops in the main.

41,825. On page 176 of your note you do not mention sugarcane at all?—Sugarcane is a special crop in this way that it does not form fertile seeds in the Punjab, so that we must get our crosses in some climate where it will produce fertile seeds, and that is done at Coimbatore. What we can do here is to select the varieties that do exist; we can test them alongside each other and so on, but for new varieties we have got to look elsewhere, and Coimbatore has to come to our help in this matter.

41,826. The reason why I asked that question was that the gross value of sugarcane in the Punjab is almost as much as cotton; it occupies one-tenth of the area, so that it is relatively a much more valuable crop in the Province?—It is a more valuable crop to the Province. I put a Deputy Director on to investigating the economic position of this crop last year and the net result of his investigations is that the crop does not really pay if you pay for your labour and everything else at Market rates. Cane crushing and *gur* boiling, however, comes into the economic system of farming at a time when farm work is slack, and it is in a way one of the subsidiary industries of the cultivator. A farmer does not have a large proportion of his holding under cane, and he can usually manage to do the cane work with the help of his own family, and with the facilities

available on the holding. The cane crushing and *gur* boiling work costs him practically nothing. The cultivator, his family and bullocks have to live whether he crushes cane and boils the *gur* or not. That does not apply, of course, in the vicinity of towns, where thick varieties of cane are grown which are used for chewing. That is a different matter altogether. The ordinary man does not grow a very large area of sugarcane. As a matter of fact, I was very much interested to discover whether a considerable proportion of the area of any one holding was under sugarcane, because, if there was, the opinion which we had come to would not hold good, but I find that only a small proportion of an ordinary holding is under cane. You will find figures in the printed report on the economic position of the sugarcane crop in the Punjab, by Mohammad Abdullah, the Deputy Director whom I put on to this work, and which can be given to you.

41,827. Is gram chiefly grown as a *barani* crop in this Province?—Yes.

41,828. On the question of *batai* cultivation, you point out that it is one of the obstacles to better cultivation. You are, of course, familiar with the work done by Professor Stewart on the economic aspect of *batai* cultivation?—Yes.

41,829. He points out that under this system the tenant makes Rs.19 profit per acre only, whereas the landlord makes Rs.30. Do you think that is a fair approximation?—He has investigated this very closely.

41,830. *Batai* tenancy is usually found where the landlord is dominant. It is not the choice of the tenant; it is due to the power of the landlord to insist on it?—Yes.

41,831. You have given a series of reasons why the Veterinary Department should remain under the Director of Agriculture. It seems to me that you get exactly the same result if you put Agriculture under the Veterinary Department. All your arguments about better co-ordination, avoidance of friction, &c., would hold good?—So long as you have a man who has a general knowledge of agriculture, I do not care which he is.

41,832. *The Chairman*: You think it quite conceivable that an officer of the Veterinary Service might be Director of Agriculture?—I would not mind, if he had the requisite qualifications.

41,833. *Mr. Calvert*: Several Directors of Agriculture at the moment are chemists. If a man comes out as a chemist to an Indian tea association, do you think he is the type to take charge of veterinary work?—That is a personal question, which I would prefer not to be asked. I do not want to criticise other people.

41,834. What is the intention of this proposal to extend the cultivated area at the Hissar Cattle Farm to six thousand acres?—To breed more improved cattle.

41,835. What are the terms of the extension? Who is going to cultivate it?—We will cultivate it just as we are doing now.

41,836. By outside tenants?—No. I am against outside tenants. If Government wants the work done well, Government must do it itself. It is not a paying proposition and you cannot get people to undertake things of that sort when they can get something which pays them better.

41,837. It will remain under the charge of the Superintendent?—Yes. We may have to split it into two or three farms on account of the risk of contagious disease.

41,838. It is not being taken away from your cattle-breeding area?—No.

41,839. *Sir Ganga Ram*: On what principle is this cultivation to be carried out?—By direct cultivation. At least, that is my idea; we have not yet come to the stage when these things have been decided.

41,840. *Professor Gangulee*: Most of the land at the Hissar farm is cultivated on the *batai* system, is it not?—No, by direct cultivation.

41,841. *Sir Ganga Ram*: What area is leased to other people?—A very small area. The Superintendent there has great difficulty in getting men to stay. Some of them would have to go many miles to get to their work, and one way of keeping them on the spot is to give them a little land to cultivate. There is also great difficulty in getting the type of man who will face these animals when he is alone. You want men of the type who will be able to look after these animals, and you do not always find them amongst the ordinary zamindari people.

41,842. *Mr. Calvert*: It has been given in evidence that fruit-growers are unable to obtain that amount of advice and technical assistance from the department which they desire?—That is true.

41,843. That is being remedied?—Yes. We are flooded with applications for advice. We have just recruited one Fruit Expert and we have budgeted this year for another.

41,844. What are the qualifications of your Poultry Specialist?—He is a man who has been interested in poultry all his life, and his wife is also interested in the subject. He has had very good training in this work.

41,845. At Lucknow the fact that this specialist had not undergone training at the Institute there was deplored?—I think we could send him there to teach the Lucknow people; he is a very good man indeed.

41,846. What happened to the effort you made to encourage bee-keeping?—It fell through, partly because there was no one who could give adequate time and attention to it. It is a subject which requires investigation and I hope we will get the staff to investigate it. The man who took it up before was not on the staff of the department, but merely got a small subsidy to carry on what was in effect semi-voluntary work.

41,847. *Mr. Kamat*: You have submitted a five-year programme for your department to your Local Government. What is your total expenditure on agriculture at the moment?—About 41 lakhs in the budget now going before the Legislative Council.

41,848. Can you give me an idea of the total revenue of this Province?—Not offhand.

41,849. I think it is between 11 and 12 crores of rupees. What is your object in submitting this programme? Do you want a sliding scale of grants, giving you more than 41 lakhs of rupees per annum, or do you merely wish to have security or a continuity for your budget from year to year?—There are several reasons why we want a programme. As regards staff, we cannot hope to move faster than we can get satisfactory graduates to fill the posts we wish to create. We are, as a matter of fact, moving rather fast in that respect; we are getting men as extra Assistant Directors of Agriculture who have to be put in charge of work before they have had sufficient experience. In the past we used to put Agricultural Assistants on a farm for three or four years before sending them out to a district. It is far better to move at the pace for which you can get facilities.

41,850. Quite, but at the same time you are getting Rs.41 lakhs for your department out of a total revenue of 11 crores. In Bombay, out of a total revenue of 15 crores, they are only spending 26 lakhs on agriculture; so that you are indeed better off here. What is the percentage in your Province of land irrigated either by canals or wells as compared with dry land? Is the irrigated land about 10 per cent. of the cultivated land?—I have not got the figures with me at the moment. There are 17 million acres of cultivable land commanded by canals.

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41,851. *Mr. Roberts*: Half the cultivated area is irrigated?—There are 17 million acres of cultivable land commanded by the existing canals, of which 11 million acres are irrigated.

41,852. *Mr. Kamat*: So that nearly 50 per cent. of cultivated area here is under irrigation. During the last twenty years what improvements have been made by your Department in the *barani* land, the dry land either by the introduction of new crops such as drought resisting crops or any other improvements specially with reference to dry lands?—Wheat 8 A is being taken up in the *barani* area and is doing extraordinarily well. Indian cottons do well, and one of these which was selected at Hansi is doing extraordinarily well, I understand, in that part. Then there are implements such as bar harrows, springtined harrows and things of that sort which are helping the cultivator to conserve moisture in the land and extend the area under crop. I am particularly keen on having something of the nature of the springtined harrow for breaking up land after rain when it is what we call in "wattar," that is to say, a state in which it is fit to be worked; because if you then break the surface of the land you can go back and plough and cultivate it at your leisure. At many places the area which a man can get under crop in *barani* land is limited by the amount of land he can break up while the land is in "wattar." I think there is a great field of opportunity for getting some simple implement to break a large area of soil surface in a short time. Unfortunately the springtined harrow costs about Rs.55.

41,853. Compared with twenty years ago, would you say that the yield per acre of *barani* land has gone up by 10 or 5 per cent. to the cultivator; have you looked into that problem from that angle?—It is very difficult to say. In *barani* areas the crop depends very greatly on the rainfall, and the outturn may fluctuate from practically nothing at all to quite a good crop in different years. Investigation for a long series of years would be necessary before we could say what percentage the output had increased. The work done for these tracts may have been very valuable, for instance, if the increase in output of wheat amounted to one maund per acre, that would amount to Rs.5 an acre, but before one could safely say that the output had increased to that extent it would be necessary to study the output returns over a very long period.

41,854. I thought really the main problem for solution was the dry farming question, and I thought that twenty years was a fairly long period?—But how would you estimate the extent of the improvement?

41,885. Do you think that twenty years is not a sufficiently long period?—Before replying to that point I want to know what you would base your data on; that is the difficulty which is not easy to get over.

41,856. Have you specialised vocational schools in addition to middle schools where agriculture is taught?—No, none in this Province.

41,857. Have you any faith in such vocational schools?—I think they are entirely wrong, for this reason amongst others: I think it takes a lad a considerable number of years to discover what he is really fitted for. That is a problem which arises all over the world. I think it is essential in any system of education to keep as many doors open as you can for as long as you can in order to give a boy with ability a chance to find his level. If you put a boy into a vocational school you are shutting him definitely into a particular rut.

41,858. I am referring to the Loni type of school; you are definitely of opinion that that system is a wrong system?—I do not approve of it here; I do not wish to criticise what people do in other Provinces.

41,859. *Professor Gangulee*: Is agriculture a compulsory subject in these middle vernacular schools?—No, it is optional.

41,860. *Mr. Kamat*: In the proceedings of your Provincial Board of Agriculture the principle was laid down in 1924 that the minimum age for specialised agricultural education should be 17 years?—Yes.

41,861. Do you hold that specialised training given to boys under the age of 17 is totally wrong?—I probably do not have many followers in this matter, but I have my own opinion.

41,862. That is exactly what I want?—If you give a boy too much manual labour at a farm you will sicken and disgust him with agriculture. What is it that makes a farmer go through the drudgery of ploughing, sowing and so on? It is the crop at the far end. But that is of no value to the boy. My desire is to develop in boys the faculties of observation and research. Every boy wants to do research; every child that you meet aged six will cross-examine one in the most extraordinary way. That faculty should be developed into research with regard to crops and other agricultural matters. The type of teaching I should like to introduce in these schools is that of showing the boys that a plant is a living thing, that soil can be made to give a greater return by treating it in a particular way, &c.; I should desire to give the boys an insight into that kind of thing so that when they come to years of responsibility and have to apply themselves to making a living from the land their knowledge of these fundamental principles will help them and they will have minds open, waiting anxiously, to imbibe any further information that can be obtained. In my opinion, if these schools do that much, they will have done a wonderful thing. I am certainly opposed to any attempt to make a farmer out of a boy of 14.

41,863. And do you think it is a waste of money to give such boys stipends and put up hostels to accommodate them while they are learning agriculture on a farm?—You can teach them a lot of things on a farm, but must not give them aching muscles and make them sick of the very sight of the farm.

41,864. On page 157 of your note you outline the policy contained in a resolution passed at a meeting of the Provincial Board of Agriculture in your Province in 1924 with regard to agricultural colleges, and you say that the recruitment to certain departments, for instance, the posts in the Irrigation Department, the posts of Sub-Inspector in the Co-operative Department, and certain posts in the Revenue Departments, should be from men who have either obtained a leaving certificate from your agricultural college or who have, at any rate, come from your college. Yesterday I was trying at the Co-operative meeting to ascertain why agricultural graduates do not take to private farming, and it was suggested to me that until recruitment for Government service was closed against them they would not take to private farming. Do you agree with that view or do you still adhere to the view contained in your resolution?—This is an agricultural Province, and it is of fundamental importance that whoever has to deal with agriculture should have a knowledge of agriculture. I think it would be of great value if all people who have to deal with agriculture underwent a course of training in agriculture to enable them to guide the zamindar and carry on work for the good of agriculture. Beyond that I would like to offer some inducement to boys to work on their own farms.

41,865. This kind of recruitment may be perfectly reasonable from your point of view, but will you look at it from another point of view? If there is not a sufficient number of agricultural graduates carrying on successful farming, will you agree that there is no demonstration to the public that training in agricultural colleges pays from the farming point of view? Purely for the purposes of demonstration, therefore, is it not to the advantage of your colleges that there should be some graduates doing successful farming?—I think so; I am very anxious to see young men coming from our college starting their own farms.

41,866. How would you achieve that result?—There is the scheme that I put forward for Shergarh; Sir Ganga Ram is one of the advocates of that scheme.

41,867. Perhaps he is the only outstanding exceptional case in the whole Province?—In that scheme we are going to take a number of boys, give them a five years' tenancy of the land and charge them perhaps Rs.8 rent per acre. I sincerely hope that something of this sort will go through; I realise that if we are going to attract boys from Government service they must be offered something good.

41,868. I think in this Province the Veterinary Department is under the control of the Provincial Government and is not entirely under the control of Local District Boards?—The District Boards usually provide their hospital buildings; also they provide a compounder, a *bhishti*, a sweeper, a *chaukidar*, the medicines, and so on; the Government then provides the Veterinary Assistant and pays his salary. The Boards control the hospitals; that is the situation.

41,869. Government is to give grants-in-aid to the needy District Local Boards under the five years' programme of establishing veterinary dispensaries?—Yes.

41,870. Unless this is done by the Local Government, do not you think no District Board can really extend the veterinary system?—It is quite true that the District Boards are very hard up. We feel we might get a little more of their funds apportioned to veterinary work than they are at present giving us. Education gets the greater part of their funds.

41,871. You are quite clear that out of their present means and without Government grants District Boards cannot do this?—Taken as a whole, no, they cannot do it.

41,872. What is the position of your Board of Economic Enquiry. Have you a definite proportion of officials and non-officials on that Board and how do you choose them?—The Chairman when here will be able to tell you about this.

41,873. Are you in favour of passing legislation against the adulteration of fertilisers?—Yes; but I think there will have to be some sort of investigation first of all into the practicability of it; to see just what Government would be up against. On the face of it I do not see why there should not be an act of that sort in India as well as elsewhere.

41,874. You think the time has come to think of some such measure?—Yes and the sooner the better, but one would have to look over the ground first and see just what one is going to be up against.

41,875. About your remarks in connection with seed merchants, men who grow seed for distribution, you have recently established better farming societies here, have you not?—Yes.

41,876. You propose that these societies should take up this sort of work, do you?—I see no reason why they should not. These people could very easily grow improved seeds and they could take the extra four annas or so charged above market rates per maund.

41,877. If the object of better farming societies avowedly is to have better farming, this could be a plank in their programme?—I have no doubt they will take to it.

41,878. *Mr. Roberts*: With reference to this question of *batai* I presume you were comparing it with cash rents?—Yes.

41,879. You had in your mind fixed cash rents, I suppose?—Yes.

41,880. You are aware, of course, that when cash rents are in practice charged the highest bidder often gets it?—Yes. But in that case the

tenant is apt to take all he can out of the soil without regard to future crops.

41,881. You say that the man will take all out of the soil. Can you not avoid it?—You can have a lease for a term of years.

41,882. The only alternative to *batai* is cash rents?—Yes.

41,883. And cash rents to give the best results should be fixed, that is your idea?—For a term of years, yes.

41,884. In practice, of course, it is not the case?—No; it is mostly year to year.

41,885. One year's agreement as a rule?—Yes.

41,886. *Mr. Calvert*: Do you know that in the United Provinces the cash rents are fixed at the time of the settlement?—That might be so.

41,887. *Mr. Roberts*: In a bad year, a year of crop failure like the present year, do you not think that the *batai* system is more lenient to the cultivator than the other system?—He takes the responsibility and either loses or gains; but I think that under the cash rent system there is more incentive to do the best he can.

41,888. It does not depend on the relation of the cash rent to the total profit?—Even in the case of a losing business the tenant will exert himself and try to lose as little as possible. After all, with the canal water supply and conditions of farming in the plains of the Punjab, one might get a good crop or a bad one just by the omission or application of a turn of irrigation.

41,889. Do you think it is a good thing to divorce the landlord from interest in the land? The cash rent system is used largely where an owner wants to live in a town away from the land. Do you think that aspect of it is good for the development of agriculture?—An absentee landlord is not a good thing, but after all you have got your cultivator or tenant on the land.

41,890. With regard to farm yard manure you are aware that in the Province generally there is a very strong belief in the good results of using cowdung for manure?—Yes.

41,891. Have you any experiments or any proof that the burning of it or not using it is not harmful?—I can say that we get extraordinarily good results from an addition of organic matter in the form of green manure and application of artificial manures shows that there is little need for things like phosphates and potash.

41,892. Could you give us a rough idea of the cost of green manuring?—It can be worked out.

41,893. Do you not think that it is rather an expensive method? Suppose I make the statement that it is an expensive system of manuring, what will be your answer to it?—It is a matter of the cost of ploughing; you get the canal water free.

41,894. Water is only a question of Rs. 2 per acre. My feeling is green manure, under the present system in the Colonies at any rate, is not paying?—We generally understand that it is paying, but I think you ought to know more about that.

41,895. As regards the organisation of the department, you have the Provinces roughly divided into two portions, half or more being under irrigation. Have you contemplated that development in the two groups? At the present moment I understand you propose to have eight Circles?—Yes.

41,896. These Circles are divided over the Province and each Circle consists of three or four districts?—Yes.

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41,897. Do you not think that it will be better to tackle the problem in two branches, one for the *barani* and well tracts and the other for the canal irrigated tracts?—You mean two research institutes?

41,898. Not exactly that, but two centres at any rate?—I think we are rapidly coming to a time when we shall have a great deal more of research done on the *barani* area than we are doing now.

41,899. This morning you emphasised the importance of discussion among experts and co-operation among different experts, meetings and so on. Is it not indeed very likely that this will be largely lost sight of by spreading the men in eight Circles?—I think you know that we find the Circles rather too big for a single man to look after.

41,900. But the point I want to get at is whether it would not be better to concentrate the experts in one area rather than spread them out?—Each will have his headquarters in his own Circle with his own experimental farm, as we have shown in the programme. He will be faced with the local conditions on the spot and make a study of them, so that no part of the Province will be left out.

41,901. How is all this going to be controlled? Have you any method of controlling or directing this work?—The control that we have at present is enough. Each man will deal with his own section. We want more staff at headquarters, I think, and that can be got as time goes on. There will be more decentralisation and Deputy Directors will have to take greater responsibilities. We are doing a bit of decentralisation now as far as the heads of sections have got the staff to deal with things. They will become small Directors of Agriculture in a way; that is to say they will have to shoulder more responsibility, each in his own Circle or section.

41,902. With regard to education I think you mentioned that you find great difficulty in getting experts for the various posts in the Agricultural Department?—Yes, it is true.

41,903. You think the time has not arrived when Lyallpur should be offering much more post-graduate training?—I would like to see a good deal of post-graduate training of the staff done at Lyallpur, but we are hard up for men; we cannot spare men from their posts.

41,904. Does not that strengthen your department? Is it not worth while taking it as an essential item of your development?—You mean taking these men back from their posts and giving them a year's training? It would be a very good thing, of course.

41,905. Would it not be a good thing if you had more men who had received post-graduate training?—It would be, but we are developing at such a rate that we need them at their various posts in the Province.

41,906. You do not think the time has come when part of the training could be given elsewhere and we could start another school? The early part of the training might be given in another school?—Do you mean that another college should take them on for the first two years?

41,907. Yes, after the Intermediate?—That system has never worked well anywhere. But perhaps you mean that we should take them into an agricultural college at the Intermediate stage, after they get their knowledge of mathematics and elementary science first? Is that what you are thinking of?

41,907A. Yes?—That is another problem. In that case the farmer has to pay for his son's education for five years instead of four after the matriculation stage before the lad gets his degree, and we lose a year's training to the boys in the atmosphere of the college. Also we lose one more thing which we get at present in the Botanical section at least, and that is that the course in botany is specially suited to the needs of the

Punjab agriculturist right from the start. By this I mean that in illustrating the principles of botanical science plant specimens are chosen whenever possible which the agriculturist should be familiar with, and the application of botanical science to agriculture is emphasised at every possible point. This would be lost if the boys got their elementary botany in an ordinary intermediate college. I agree that when I was a teacher in the Lyallpur College I found difficulty about the standard of English which the boys have to start with. It takes a great deal of patience for the first year, or couple of years to teach the boys. The boys came into the college with the idea that there was nothing to be learned there, but that it was an easy avenue for Government service. That is the sort of attitude we were up against with the boy when he stepped into the college. So that the first thing that I had to do with my own subject was to show them that there was a practical application of what I was teaching and right from the very first year to the end I have had to show them what bearing this had on practical agriculture, for instance why you take cuttings of this plant and why you take seeds of that to reproduce it agriculturally, what the results obtained were, and so on. If we are going to give the boys their elementary training in botany, chemistry, &c., in another college then they are going to lose all that. I do not say the same thing happens in chemistry as in botany, because you get practically the same chemistry in every college for the first two years. Biology lends itself to this kind of thing and we will lose the bit of training which we are already giving them if we raise the standard of admission to the Agricultural College. Of course I quite realise that we would get boys into the college with a higher standard of education to start with, but at the present moment the English that is taught to the boys in the B.Sc. degree in Agriculture is the same as is taught in the F.Sc., and if you get them into the Agricultural College at the F.Sc. stage and give them no more English they are going to get no more English than they get at present.

41,908. If the Botanist was a man who had an agricultural training, your objection to giving part of an agricultural training in one college and part in another would largely disappear, would it?—I had a talk about this subject in most of the colleges in Britain in 1920 and the men I met were all against having two years in one college and another two years in another college. The point is that although you put down the same syllabus in the two colleges the idiosyncracies of the men in the two different colleges are not the same. If on the other hand the boys are under the same teacher from start to finish, they know his ways and his methods, and the whole thing is very easy. In the other case quite a lot of time is lost not only to the teachers in going over old ground but to the boys themselves.

41,909. Is it possible at all to identify University education in other subjects such as chemistry, botany, physiology, and so on, with agriculture? Is it possible to do more than is being done in the University?—We have some of the M.Scs. from the Punjab University on the staff of the Agricultural College who are cotton research students; at Lyallpur also we have M.Scs. of the Punjab University. After they have gone through their scholarship they may take up posts in the Agricultural Department.

41,910. It opens up a wider field for research workers, I suppose?—Yes; we are indebted to the Punjab University for many of the men on our staff.

41,911. You mention in your evidence that you are very keen to see a Hydraulic Station started to study the water requirements of crops, the intensity of cropping, and so on. Has the Department considered the question of what intensity of cropping is the best in the Province?—Mr. Stewart has been doing some work on this subject; I rather think that

the results are in his last year's Annual Report. As a matter of fact, I think your own experiments have been continued by him. It is rather interesting to note that he finds that the higher intensity of cropping give a higher profit.

41,912. It is quite possible that the higher intensity of cropping may result in better agriculture?—Yes, I think so.

41,913. Do you not think that that opens out a very big field in connection with the best type of canals? Supposing that it was proved that the higher intensity of cropping gave the best results, then the problem for the Engineer is to design a canal which would carry that amount of water if the water was available, so that it opens out an entirely new field? —That is a question of fundamental importance to the Province.

The Commission then adjourned till 10 *a.m. on Tuesday, the* 1*st March*, 1927.

Tuesday, March 1st, 1927.
LAHORE.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.
Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc.
Co-opted Members.

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH.
Joint Secretaries.

Mr. D. MILNE.

Further Oral Evidence.

41,914. *Sir Henry Lawrence*: You have drawn up a programme for the expansion of your Department, covering a period of five years, and you told us that you proposed a non-recurring expenditure of over 72 lakhs and a recurring expenditure of 20 lakhs. Are those the correct figures?—Yes. Without *tehsil* farmers we are now trying better farming societies, and if they do well we will not introduce so many of these *tehsil* farms of 50 acres each as we have mentioned in the five years' programme. There are some 32, which we may omit. We were going to have a farm in each *tehsil*. If we have to have those *tehsil* farms that will add Rs.73,900 *recurring* and Rs.10,94,000 *non-recurring*. The total would then be Rs.21,33,000 recurring and Rs.83,14,000 non-recurring, but we are not in a position to say how much of the *money* for the *tehsil* farms will be necessary.

41,915. Will that give you a farm in every *tehsil*?—Yes, but we will not put a *tehsil* farm in a *tehsil* where there is already either an experimental or a district farm.

41,916. Will this programme give you a farm of some sort in every *tehsil* in the Province?—Yes.

41,917. And it represents the limit of your possible advance in five years?—It is what we think advisable in view of certain limitations with regard to staff, and so on.

41,918. How many *tehsils* have you in the Province?—Something over a hundred.

41,919. Six or seven in each district?—The number of *tehsils* varies from four to seven per district.

41,920. I was comparing your staff and your proposals with what is being done, for instance, with regard to medical and veterinary dispensaries. One of the zamindars at Jullundur the other day made this comparison, which struck me as a very acute one. He said, "Our crops have diseases just as human beings and cattle have. Why do you not give us doctors for our crop diseases, as you do for our human and cattle diseases?" Do you agree that it is as important to feed the people as to cure them of diseases?—Yes.

41,921. You would accept the comparison made by this zamindar as a sound one?—We need doctors for plant diseases just as for human and

animal diseases. I lay great emphasis on the need for research to understand our problems and to know how to tackle them.

41,922. You are spending at the present moment something under 25 lakhs?—That brings up another point. Yesterday I gave the figure for my budget as 41 lakhs. I was speaking then of the budget which I have prepared for the Legislative Council that is now sitting, but the budget for 1926-7 amounts to 35·4 lakhs.

41,923. Is that for agriculture only?—No, for veterinary work as well.

41,924. I am speaking now of agriculture as distinct from veterinary work. What is the budget for agriculture alone?—It is about 25 lakhs.

41,925. That includes the working of your farms, and you recover 5 lakhs?—Yes.

41,926. So you are not spending net more than 20 lakhs a year?—That is so.

41,927. Although nearly 60 lakhs are being spent on medical and public health work?—Yes. Probably something like that.

41,928. I merely wish to establish some sort of relation between these two sets of figures. When your five years' programme is finished, you will add a maximum of 30 lakhs to your present 20 lakhs?—The figure for recurring expenditure is Rs. 21,33,000, and there is a figure of 10 lakhs for non-recurring expenditure on tahsil farms.

41,929. There is only Rs.73,000 recurring expenditure on these farms?—Yes: roughly.

41,930. So that there will be 21 lakhs addition to your present 20?—Yes, less income.

41,931. Making a total of 40 lakhs, roughly speaking?—Yes.

41,932. You are still a long way below the expenditure on human diseases?—Yes.

41,933. There are 483 medical dispensaries and it is proposed to add another 375?—Yes.

41,934. Whereas your institutions for crop diseases are limited to somewhere about 130?—I think there will be about 115 if we have a farm in each tahsil.

41,935. I am just carrying out the idea of this intelligent zamindar. You have over 800 institutions for human diseases, but little more than 100 for crop diseases. For veterinary diseases there are 192 dispensaries?—We have 202 now.

41,936. And you propose to open another 100?—Yes.

41,937. So there will be over 300 veterinary dispensaries as against your 100 agricultural. Do you think that is the right proportion?—Naturally I would like to see more, but my difficulty is that we must not push our rate of expansion too fast.

41,938. Agriculture is the foundation of everything, is it not?—Yes. We want a greater proportion of the Government money available.

41,939. If you were to have a wider expansion of agricultural work, would you be able to meet the needs of that from the Lyallpur College?—We would have to extend it.

41,940. You would extend the one institution?—Yes.

41,941. You are not in favour of starting a separate institution in the east of the Province in the *barani* area?—No. I went into this case very carefully in 1920 and consulted many authorities at home and abroad, and they were all against frittering away our energies by having one or two

smaller places instead of one well-equipped institution. One authority, who happened to be in India at the time told me that in America they like their colleges to go up to five thousand students before they start more. That seemed to me a very high figure. But we have only 260 students at the present time at Lyallpur, and we are thus a long way from achieving the position when I would suggest starting another agricultural college in this Province.

41,942. In the United Kingdom how many agricultural institutions of good reputation are there?—

Mr. Calvert: 16?—15 or 16, with an agricultural population of three millions.

41,943. *Sir Henry Lawrence*: I gather from one or two remarks you have made that you are not satisfied that cattle breeding pays. Are you satisfied it cannot be made to pay? Crops are what every man goes for at the present moment, because they pay better than cattle. I expect the prices of cattle will rise, and Government is doing something to improve the situation by reducing cattle rates for fodder. I would like to see a great improvement in our cattle, and I think it could be brought about by mere selection from those we have got in the Province. By mere selection we have practically doubled the yield of milk in the cows at our dairy at Lyallpur, which are of the Montgomery breed.

41,944. Are you aiming at a dual purpose animal?—Yes, with the Hariana breed. I think that is a sound policy for the ordinary cultivator. For dairies, first crosses will be the best.

41,945. At the present moment is the milk that the people of this Province consume derived almost entirely from buffaloes?—A great deal of it is.

41,946. You have roughly 3,000,000 female buffaloes and 3,000,000 cows, and the cows give very little more than is necessary for rearing ploughs bullocks. It seems to follow that almost all the milk consumed is derived from buffaloes?—There were 2,793,000 cows at the last census, and 2,611,000 female buffaloes.

41,947. Roughly 3,000,000 of each, for the purpose of comparison?—Yes.

41,948. Do you agree with the view given by the veterinary authorities that the main hope of improvement in cattle-breeding lies in the castration of useless bulls?—That is a big factor.

41,949. You are hopeful that that can be achieved?—We have done extraordinarily well in this Province. The number of castrations done in the Punjab last year was greater than in all the rest of India put together.

41,950. It was 183,000 last year?—Yes.

41,951. Do you know how many bulls there are in the Province?—Do you mean selected animals?

41,952. No, I mean male stock capable of propagating their species?—The number given in the Season and Crop report is 12,594.

41,953. The male stock is 4½ millions, and we have been told that 183,000 were castrated last year; that figure must refer to selected animals?—Young stock of cattle is given as 3,063,196, and young stock of buffaloes at about 2,106,000.

41,954. I want to know the conditions which you think must be achieved in order to make cattle-breeding a paying proposition; one is the castration of useless bulls?—Yes.

41,955. Another is increase of milk in cows?—Yes.

41,956. What else do you postulate as necessary?—No doubt the subject has its difficulties, but in the canal irrigated area I would be inclined to reduce the rate on fodder crops even further and correspondingly increase the rates on other crops; that would not reduce the revenue; but the same revenue would be derived from a farm in a different way. It is a question of what profit the farmer gets from cultivating his crops, and what from rearing cattle; at present the farmer finds he is better off if he puts as much as possible of his land under food crops, cotton and so on.

41,957. You would lead the zamindar to cattle-breeding by some form of economic pressure?—Unless we give him some money for his trouble he is not going to pay attention to cattle-breeding.

41,958. Is that so?—I think that is so. Of course, there will probably come a time when he cannot get bullocks elsewhere at as cheap a rate as at present.

41,959. There have been conditions attached to the holding of land to induce zamindars to breed horses?—Yes.

41,960. Are any such conditions attached to holdings to induce them to breed cattle?—We have got cattle-breeding grants.

41,961. On a large scale?—Yes.

41,962. Are they working satisfactorily?—Some of them none too well About 8,000 acres of land have been set apart in two farms for the Montgomery breed and there are three farms totalling about 7,271 acres for the Hariana breed; the areas of the latter three farms are 3,140, 3,131 and 1,000 acres.

41,963. Those are three large grantee farms?—Yes.

41,964. I am speaking more of the conditions attached to the holding of a square or two squares here and there; is that not the method on which horse-breeding is conducted?—Yes.

41,965. Is there anything corresponding to that with regard to cattle-breeding?—There are the Shergarh grants, totalling about 5,000 acres; speaking off hand, the grants are half a square, a square or a square and a half, and the grantees have got to keep either one or two cows per square.

41,966. Is that working satisfactorily?—That has done very well; I inspected these grants a few weeks ago and I saw some very fine cattle. The grantees there are old *janglis;* they are cattle-breeders born and bred and are very fond of cattle; I must confess they were the finest cattle I have seen in the Punjab except, of course, those on the big cattle farm at Hissar and other Government farms; they were the finest cattle I had seen amongst the grantees.

41,967. Are grants given for the improvement of agriculture, distribution of seed and so forth?—Yes.

41,968. Are the grantees doing any good in teaching improved methods to their neighbours?—Yes; Mr. Roberts and Mr. Conville are doing very well indeed; we have no complaints against them.

41,969. Can you speak in the presence of Mr. Roberts without undue inconvenience? Do you think he is doing any good to his neighbours?—I think he is doing an immense amount of good; if you look up the records of his farm in my annual reports you will find that the outturns on his farm are extraordinarily high.

41,970. That is good for himself?—Yes, and it is also good for his neighbours.

41,971. How?—Because it shows his neighbours that these outturns can be got on a farm run on economic lines; that is a very important point.

When I came to the Punjab I used to have old farmers coming round to my plots, and their remarks to me usually were: "Oh yes, that is a very fine crop of wheat or cotton, but you have got the Government at your back; you have all sorts of facilities that we poor zamindars have not got; it is not possible to have crops like that on an ordinary zamindari farm run as an economic concern." Now these two grants to which I refer show conclusively that it is possible to run a farm with high overhead expenses and still make money out of it, and a great deal of money. That is one benefit which I feel we are getting out of these grants: the outturns got per acre are such that they show that better cultivation will give better yields, and that if the people around do the same there is no reason why they should not get the same results; they need not even have the same overhead expenses. I feel that these farms have created a desire on the part of the people to do likewise; and that is exactly the spirit we want to foster. In my opinion there is no reason why the cultivation in this Province should not be greatly improved; in fact, that is one of the most important lines of improvement of agriculture in this Province.

41,972. I am afraid this question must be very inconvenient to you, but I also want to know whether Sir Ganga Ram has done any good to the country?—I am sure he has, by the same example; he has taken things in hand which other people at the time would not touch and he has made them a success. After he has proved that a thing is sound and good we get many offers from others, but in the past there were no other Sir Ganga Rams coming round offering to take up the schemes which he took up.

41,973. When Sir Ganga Ram took up this irrigation, people did not think it would succeed?—No, there was a decided opinion against it; in fact, I should say that the majority of people were perfectly certain that at last he had touched something on which he would burn his fingers.

41,974. That is very interesting with regard to the future expansion of other schemes elsewhere?—It is.

41,975. You are definitely of opinion that the grant of large blocks of land to intelligent persons (we will not put it higher than that) may be of benefit to the State?—These grants have been of benefit to the State; in fact, they have been of very great benefit. Our difficulty, of course, is to get the right people who will do something when they do get the land.

41,976. Does that also apply to the estates of two gentlemen whose evidence is coming forward, Colonel Cole and Major Vaurenen?—Those are under the Military Department; they are not under me, but they are certainly farming very well and we get a lot of help from them; for example, we are able to purchase large quantities of seed from them, and so on.

41,977. Can you tell us anything about the Okara Estate?—The Oat and Hay farm at Okara is the farm I mentioned yesterday. On one occasion when I went over it, I saw an interesting comparison between a square of land which had been cultivated by up-to-date methods and a square of land alongside which had been cultivated in the ordinary way. Both were cropped with cotton, and there was nearly double the crop of cotton on the one that was properly cultivated than there was on the other, showing how much one can add to one's income by better cultivation. Good cultivation is most important.

41,978. That estate is in the possession of the Military grass farm?—Yes.

41,979. That also is spreading ideas of better farming?—I have not been in touch with it recently, but there was a man there with whom I had a great deal to do, Captain Flowerdew; he was a man extraordinarily keen on farming and he did an immense amount of good; he experienced

difficulties in connection with the introduction of modern agricultural implements as nobody in his villages knew how to mend them, and so he had blacksmiths and other people trained and sent out to these villages; the Agricultural Department used to help him as far as it could. The way he managed to get these people to take up modern methods of farming was of great value to the country; it was a great loss to the locality when he went home.

41,980. Can you tell me whether the hydro-electric scheme when it comes into being is going to be of value to the farmer?—It will be a source of power; perhaps it might be applied for lifting water from wells and purposes of that sort. As a matter of fact, I was a party to writing a note on this subject, but I have not seen it for, I suppose, a couple of years and I have forgotten what I did write. I think Sir Ganga Ram was interested in that note also.

41,981. Will the hydro-electric scheme be of any use with reference to drainage; the lifting of subsoil water where it is doing harm?—Yes, it might be very easily.

41,982. Is that definitely part of the scheme in view?—I do not know whether it is definitely part of the scheme, but of course it is a very possible thing; I think we did mention that in our note.

41,983. *Sir Ganga Ram:* Is there any natural correlation between a good milking animal and a good draught animal? That is, is it necessary that a good milking animal should be a good draught animal?—Not necessarily.

41,984. Therefore it might be possible to have cattle breeding as a paying proposition for the purpose of draught animals, in which case the man will give the whole of the mother's milk to the calf. Have you considered that question?—I think it would be better if there is sufficient milk to supply the family as well.

41,985. I only want to ask you whether there is any correlation between these two things?—It is quite possible to have an animal which is a very good draught animal but not a good milker and it is quite possible that an animal may be a good milker and not a good draught animal.

41,986. Therefore with regard to the question whether cattle-breeding is paying or not, the two things might be tried as separate propositions? Have you considered that question?—Yes; I prefer the other.

41,987. You said yesterday in reply to the Chairman that there is no room for establishing another Agricultural College. How many students have you admitted this year?—We admitted 74 out of the total number of applications of 375.

41,988. The rejection of others is purely due to want of accommodation?—The numbers.

41,989. What do you think the number of applications will go up to in the next ten years, supposing the accommodation were available?—That depends on very many things. If we could get some scheme by which we could get lads to go back to the land it might be anything at all. That is one of the reasons why I am pressing for the Shergarh scheme.

41,990. Considering the present circumstances do you not think that in another ten years you will have about a thousand applications?—There again you see it depends how far other departments of Government are prepared to insist on a training in agriculture for those officers who have to deal with agriculture. It would also depend on how far the Indian States in the Province come forward. It depends on a great many things.

41,991. What is the maximum room for expansion in Lyallpur?—Anything whatsoever. *Mr. Calvert:* In the present buildings?—No.

41,992.

41,993. *Sir Ganga Ram:* You referred yesterday to the burning of cowdung. Do you not think that the Chenab Colony is fortunate in being able to grow cotton under irrigation and having cotton sticks for fuel, thus reducing the burning of cowdung?—Yes, it adds to the fuel supply in the colony.

41,994. At what rate of profit do you supply seed to the people, 4 annas a maund?—Yes, about 4 annas a maund.

41,995. Do you sell on cash system?—Yes.

41,996. Supposing the man has not got the cash, what do you do?—He will find it somewhere.

41,997. So that forces him to go and borrow from the moneylender? He has got the co-operative society to go to.

41,998. In every other Province that we have seen the seed is distributed on the *sawai* system. Do you think that system might be introduced in this Province in the case of those people who cannot pay cash?—I have considered this a little. I may tell you that as early as 1909 I used this particular system myself in connection with potatoes. We gave the seed at planting time and we took back 1¼ maunds at harvest. It worked without any trouble whatsoever; but that was dealing with a small thing. In the case of cotton it is not possible to work this system because people send the cotton seeds to the ginneries and they are not able to get the same seeds back pure. It is not a feasible thing for cotton. In the case of wheat it has more chance, but we cannot compare ourselves in the Punjab with the United Provinces where the system is in vogue as the United Provinces has its big landlords. The system is perfectly simple if you have a number of big landowners who will take a certain quantity of seed from the Agricultural Department, distribute it among the tenants and get it back again. But if you have got to deal with a large number of small tenants it means a large supervising staff running backwards and forwards to inspect the crop when growing and get the seed back.

41,999. In that case, would you support the idea of a private firm or any other respectable body taking the seed from you and distributing it at say 12 or 15 per cent. interest, for I consider that 25 per cent. is too much? In the United Provinces they are giving contracts to private people. Have you considered that question?—What would be the advantage? Do you think farmers are going to get it cheaper than at present?

Cheaper and also on credit, so they need not necessarily go to the moneylender and get any seed, pure or impure?—Would you give the seed supplying firm a monopoly?

The monopoly would be for a certain area?—So it would be a monopoly. You wish to ask us to hand over the seeds which we have carefully nursed and kept pure for years to a Company? Take the case of 4 F which has been distributed by the Agricultural Department since 1913 and is still reasonably pure; if we are going to hand over this sort of thing to a company to distribute to the farmers I hardly think it would have been available to farmers in as pure a state as it is to-day.

It is a suggestion brought out from the experience of various Provinces; you might consider that?—Yes.

42,000. Have you made any research in white gram, Kabuli gram crossed with Indian gram?—I saw in Karachi there was a demand for it. I can give you samples of it if you want. I grow some Kabuli gram but grow it for our own use. Somehow or other you know the price varies with the yield. Therefore we do not grow it on a large scale as compared with the ordinary country gram. In the Sahra cattle farm people were getting it from an irrigated area. They were getting Rs.40 a *bigha* simply as *melkhan* because they have got lots of water and the zamindars can get a lot of money out of

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that. I should like to know what is the area that is leased out?—I know that the Kabuli gram is very greatly in demand but it is a very small cropper.

42,001. Have you got an engineering course in your teaching?—Yes, in the Agricultural College, Lyallpur.

42,002. Can the students calculate what horse-power is required to raise a required quantity of water?—Yes, they can; they get a very good course there.

My experience is that they know nothing about it because I have asked them these questions and they could not reply. However, I shall accept your statement. You could perhaps make an improvement in that line.

42,003. In regard to poultry have you got incubators?—Yes; but we have not yet started poultry work properly. We have just got an expert appointed.

I only suggest that incubators play a prominent part in making it a paying proposition?—Yes; that we are now going to pay more attention to.

42,004. Have you made any experiments on dry farming?—Yes, at Gurdaspur.

42,005. On the lines of the system which is in vogue in America, producing seed which will grow in dry areas?—Our Punjab 8 A wheat is a very good *barani* wheat.

42,006. Have you made any research on the American basis?—Regarding seed suitable for dry areas?

Yes?—In the case of gram we are experimenting to see which types are most profitable in particular areas; we have not yet touched *bajri* and *juar* and things of that sort which are typical *barani* crops.

42,007. You know that the Government of India every year gives scholarships for students going to England to study certain industries?—Yes.

42,008. Have you ever claimed a scholarship for any of your students for going to learn the method of making super-phosphates?—No boy from the Agricultural College has gone on that work yet.

42,009. You have never claimed it?—After all it is the boy himself who should come forward; one cannot compel a boy to take up a subject.

There is no need of compulsion; you will get any number of applications for it. I only suggest that you should claim a scholarship for that industry?—The making of artificial manures?

Yes. I may tell you that Dr. Fowler has told us in his evidence that all this grass which grows on the banks of the canals can be converted into organic nitrogen. Will you correspond with him and get information on that point? It is very important for the Punjab?—Yes.

42,010. Have you any information about the natural deposits of fertilisers in the Punjab?—I have not studied that question.

42,011. Have you made any research in connection with the enormous amount of gypsum which is lying about the foot of the hills?—We use it in the reclamation of *bara* land.

42,012. I might tell you that in Bombay they are buying it at fabulous rates and using it?—Our soils are rich in lime.

I told you the other day at Hissar that the way to increase the yield would be not to put in tube wells because tube wells at that point do not seem possible; tube wells will not work if the lift is more than 40 feet and the sub-soil water will never rise above the spring level. So your best plan would be not to attempt to put tube wells where the depth is more than 40 feet; that will not be a paying concern.

42,013. *Sir Thomas Middleton*: On page 183 of the Punjab memorandum there is a statement showing the increasing budgets of the department

from 1906 onwards. Are these figures comparable? Do they include the same groups of things in each year?—The department is continually expanding.

42,014. Take your last figure of 38 lakhs: does that include co-operative credit?—No; this is simply agriculture, pure and simple; we are budgeting a good deal at present with a view to buying land for new farms.

42,015. It does not seem to correspond to the total budget figure?—That is so. But first of all the figures in the memorandum are for agriculture proper, excluding veterinary, and if you add the latter you will get my budget figures which I am giving you.

42,016. I can only make the figures agree by deducting co-operative credit?—I notice another point about these figures, they include the money for major and minor works, which is in the Public Works Department budget.

I see now how the difference is accounted for.

42,017. *Sir Henry Lawrence*: Is this figure of 14 lakhs in excess of your budget due to the Public Works Department expenditure?—I should like to give you a detached statement of all these figures a little later if you have no objection.

Yes, we would be glad if you would let us have that?—Very well, I will do so.

42,018. *Sir Thomas Middleton*: You explained to us that the system of the annual budget, since it lacks continuity, does not permit of the getting of trained men. Do you consider that if a considered scheme approved for five years were formulated you would be able to train the men?—It is very difficult for me to ask for men for a post unless the Council have actually passed that particular post. I mean, supposing the Council is sitting to-day and are considering a budget demand for the second year's instalment of that five years' programme, I cannot easily ask for trained men for the third or fourth year's instalment before it has been passed by the Council. It would certainly be an advantage if we could get a general blessing on the scheme. It would then be possible to get men ahead of the time and give them the necessary training.

42,019. In other words, in an expanding scheme of this sort you must have something in the nature of a fund to which you can look forward; you must have a programme approved for a period of years, otherwise you cannot train your men satisfactorily?—We ought to get the men and train them before we get our farms actually opened.

42,020. That brings us to the next point: in speaking of horticulture you said that an army of workers was wanted. If you look through your requirements in other directions you will find that it is quite clear that the number of people you will require at the end of five years will be large. How are you going to get these assistants if it is not possible to make provision by means of training schemes?—One of our difficulties is getting trained men.

42,021. The schemes are of no use unless you can get men to work them out?—That is quite true; the question of men is a real difficulty. As a matter of fact, I put in for a Second Fruit Specialist recently, and I think I can fill this post by appointing one of the men I know who are looking round for employment, but generally we have the greatest difficulty in getting men ready trained and fit to take up the work.

42,022. You cannot expect to get them ready trained, and you would have to train them?—Yes, there is a great deal of truth in that.

42,023. Now I want you to consider the types of training you require to make your schemes effective. You have two classes of men to consider:

those who are to be mainly field workers in contact with the zamindar, and those who will be workers at headquarters, that is specialists, research workers, and so on. Let me ask you to indicate the kind of training that is required for each of these groups?—So far as the A class men for field work are concerned, we now engage B.Sc. men, and our aim is to put them under the guidance and instruction of a Deputy Director at his headquarters experimental farm for a couple of years or so. The Deputy Director then gets to know what that boy is capable of doing before he sends him out to a district in his circle.

42,024. It is quite easy to train young men at College for the B.Sc., but it is extremely difficult to make them practical workers among zamindars. As a matter of fact, since we have come to this Province we have had a very strong criticism of the practical knowledge of some of the people you are turning out at Lyallpur. The question is whether the amount of practical training that is provided for these young people is sufficient?—Mr. Roberts who is with you now will be able to tell about this. He taught the subject. At Lyallpur we have a students' farm in which every student has to cultivate a certain area of land himself, and for the bigger agricultural operations the students are taken on to the experimental farm which is close by the College, and they see how experiments are carried out in the area under direct cultivation, and also agricultural operations are carried out by the tenants on the farm. This training extends throughout the whole period of four years. I do not quite see what more we can do. Your point would be an argument in favour of not having the proposed three years' course. I know that we want all the practical training that we possibly can give the boys. But when you go to Lyallpur and you see Mr. Stewart, the Professor of Agriculture there, I think you will agree that there is a great deal of practical instruction of a very sound nature given to the students.

42,025. I admit that you may be giving all the practical instruction that is possible in a college course, but there is a great deal more wanted to fit a man to be a capable Deputy Director?—That of course requires, in my opinion, a bit more training of a different nature altogether. A very sound grounding in the sciences and training in the general principles of agriculture is needed before that begins; then they want a wide experience.

42,026. That is no doubt necessary, but the wide experience must be in the Punjab; the foundation of it all must be in the Punjab; and that indicates that you must look for your personnel to the Punjab, and essentially to the cultivating classes of the Punjab in the future?—I am strongly in favour of getting our men from the middle-class farmers, that is from the class of men who really farm and know about farming intimately.

42,027. If you took on such a man in the department, what salary would you offer him at present?—The salary of the Agricultural Assistant of the A Class is Rs.100-10-300.

42,028. What would his prospects of promotion to the next grade be?—He might become an Extra-Assistant Director of Agriculture on Rs.200, rising to Rs.750. The next grade to that is the Deputy Director, and the salary for that, of course, is in the melting pot at the present moment, because the new Service rules have not yet come into force.

42,029. There are, I take it, two ways of attracting men, one is by increasing the initial salary, and the other is by offering good prospects of promotion right through his service. Which do you think is best adapted for the conditions obtaining in the Punjab?—I think that as far as both the Agricultural Assistants and Extra-Assistant Directors of Agriculture are concerned

the pay is reasonable. But I would like to see the Deputy Directors well paid.

42,030. Let us go back for a moment: you take young men as Assistants on Rs.100. What qualifications are required in the case of these young men?—For the Rs.100—10—300 grade we take a B.Sc. in Agriculture; then there is the B class Agricultural Assistant who must have the Agricultural College Leaving Certificate. These men are taken in on the Rs.70 to Rs.180 grade.

42,031. Is there any considerable period of probation during which he must acquire experience and knowledge?—A two years' probation.

42,032. How do you arrange for the training of the other type of man: how do you recruit for your specialist work?—Previously we used to have I.A.S. officers. We are now getting young men of the Punjab who have been trained in Britain, or America or elsewhere, and who have taken a University degree. Also some of our men have been promoted.

42,033. Would you agree that a University degree is essential?—For a Deputy Director it is.

42,034. Or for a man entering the research service?—Yes. For that it is not good enough. I would like a prospective research worker to have further special training after the ordinary B.Sc.

42,035. Would you agree that if a research service is to be developed in India the departments must work in close co-operation with the Indian universities?—Yes.

42,036. What is happening in the case of the Punjab? Do you employ any of their M.Scs.?—We have several of them engaged in research and teaching at Lyallpur.

42,037. The interchange at present exists in the Punjab?—We get the best men we possibly can to fill the posts we have to offer.

42,038. Does the Punjab University grant the degree of Doctor?—Yes.

42,039. If you were filling a research post would you take a young man who has taken his M.Sc. degree with distinction straight away or would you put him on probation?—All our men are on probation for two years.

42,040. Assuming you find a man satisfactory in a lower post, do you not think it desirable that he should have a period of further training before being taken on to the regular research staff?—Yes. We have one man at the present time who is getting further training in Trinidad. He will be back in two years' time.

42,041. Have you any scheme providing for further training?—The particular scholarship this man has got is for study abroad. We have several other people who have gone abroad at their own expense. There is one in London getting further training now. He is already in the Service.

42,042. Would it not be a good thing to offer a certain number of scholarships, which might provide men in excess of your requirements, so that you would be able to make a selection from among them? For example, in plant breeding until a man has been at work for three or four years you cannot tell whether he will be of any value?—Yes, I think it would be sound to have such scholarships.

42,043. You have not considered a scheme for that purpose?—We have this one scholarship, and the question of increasing the number of scholarships is being considered.

42,044. With this big programme in front of you, you have need of something of that kind for research and also for field work?—Yes.

42,045. You said it would assist your department if the Government of India had a corps of experts whom you could indent on for the Provinces. It

might be a little difficult to work such a system in India itself. Agricultural research is highly specialised in a number of branches. Would you regard favourably some scheme by which one might be enabled to draw temporarily on a corps of experts provided for Imperial purposes?—I have not thought of that.

42,046. Has your attention been directed to a recent development in Kenya for the investigation of certain points in connection with the animal nutrition?—That is a scheme with which our chemist is in close touch.

42,047. Do you know how it is being worked? Kenya is borrowing temporarily one or two trained men from an institution in Scotland. Would it not assist you in India if similar arrangements could be made?—Yes.

42,048. I thought you might reply that it would not help you much in dealing with your crop problems?—I think it would. You cannot expect a man to know local conditions the moment he arrives, but the Cotton Research Botanist at Lyallpur only joined us a little over a year ago, and he is settling down to his work well.

42,048A. Such men could only be lent for comparatively short periods. I thought you might say they would be of value for nutrition problems, but that in the Punjab you must work out your own crop problems?—The man to whom I have referred is on cotton work in the Punjab for five years, and I feel sure he will do good before he leaves.

42,049. Is it your opinion that crop work is essentially local in its character?—The local factors are very important. You must study the question locally.

42,050. You do not get very far by depending on first principles?—Within limits, the work must be done on the spot.

42,051. I think you are yourself a cotton expert?—I have worked on cotton a good deal.

42,052. To what extent have you attempted to improve your cottons by using as parents the finer cottons of India? I am thinking now of such cotton as Broach?—We have done a good deal of crossing at Lyallpur, but we got ahead more quickly to start with by isolating and multiplying the best of the varieties found in the mixtures already grown. There are so many varieties already in existence that if we take the best of them and eliminate the worst we can increase the output of the crop immensely. We found that crossing work wanted more staff than we had at the time. There was also considerable difficulty in getting anything better than what we had at hand to start with.

42,053. You mentioned the necessity for dealing with crop disease. Speaking generally, how do you expect to be able to tackle crop diseases most effectively? Is it by the breeding of disease-resisting varieties, or can much be done by treatment?—It is very difficult to breed varieties which will resist certain diseases. It is a long job in most cases. People expect results from us quickly, and we have to try to do that first which will have an immediate effect and work deeper as we go on. People want results. I do not mean to say that deeper research should be neglected, but things which seem likely to give a result quickly must be taken in hand first, otherwise the public are apt to lose faith in us.

42,054. What about mosaic in sugarcane?—I have not touched that at all.

42,055. What methods of publication are open to you for the work you are doing? You have for research work the Memoirs of the Government of India, and you have the *Agricultural Journal of India*. What other means have you for publishing your work for local use?—Any officer who has got anything of real value to publish sends it to me and it is published.

42,083. Your Agricultural Department, apart from the veterinary, at present costs about 38½ lakhs, and your new recurring expenditure will be 17 lakhs, which will give a total of 55½ lakhs. The total expenditure of both departments together will, therefore, amount to 74 lakhs of rupees. Do you think, when the end of this programme is reached, one officer of the rank and status of a Director will be able efficiently to control the establishment and staff spending this amount of money?—Yes. I think, given staff, he ought to be able to do it.

42,084. Will he not be too much occupied in the details?—No, I think he should be freed from the details; he will have to decentralise a lot of this work to his Deputy Directors and heads of sections.

42,084A. There are some things which must come to him as head of the department; is not there a danger that the burden may be too great; would it not be better to have a separate Director or head of the Civil Veterinary Department, including cattle breeding, and a separate man for Agriculture, in the same way that the Registrar of Co-operative Societies is separate, and all three co-ordinated under an officer of the rank and status of, say, the Financial Commissioner?—I do not think so; I have given a great deal of thought to this, and I have given my reasons in my written evidence. If you had asked me this question when I became Director of Agriculture four years ago, I should have said at once: "Yes, do so"; but the more I think of our five years' programme of development of agriculture and the more I see how we are going to be interwoven in this development, the more convinced I am that it would be a retrograde step to separate these sections.

42,085. Have you considered it from the point of view of the large amount of expenditure the Director will have to control in the future if he still controls both departments?—I think all that kind of thing is a matter of staff. We were at Hissar the other day, and Mr. Branford there complains that he is over-worked, but his work is only one little bit of the department; many of the men around me to-day are over-worked who have half, a third or a tenth of the responsibilities that I have to deal with; it is a question of staff whatever one does; if you get the facilities to do a piece of work it can be done.

42,086. And there is not a danger of the Director being over-worked?—There is if he does not get staff; if he gets staff there is no danger.

42,087. But still a great deal must come to the head of the department, must it not?—Yes.

42,088. You do not see any danger of the Director being over-worked?—I think the work can be arranged for.

42,089. *Sir James MacKenna*: Have you a statistical branch attached to your office?—No. The method of getting any small piece of statistical work done that is done is rather complicated; I mean as regards crop forecasts, for which I am responsible. The actual compilation of the statistics is done in the office of the Director of Land Records.

42,090. I inferred from your evidence that the Punjab proposes to develop the demonstration farm idea to the extent of having one in each *tehsil*?—That is right, provided the better farming societies do not give equivalent results; we will first see how far they fulfil the need; if they do we shall not push the idea of the *tehsil* farms.

42,091. From a perusal of the reports of the other Provinces, I suppose you have noticed that the tendency in most Provinces is for demonstration on a cultivator's field as apart from a central demonstration farm?—We want both, and I will explain why I think so. Demonstrations on the fields of zamindars are excellent; the zamindar knows exactly what we have done and what he has done himself, what water has been given, and so on. This is very important, as farmers came round my fields as early as 1908 or 1909

and said: "Yes, these crops are very good, but you have got capital behind you; no ordinary farmer could do what you do." To which I replied: "Take these new varieties on to your own land, and we will look after them." As early as 1909 we did this in the case of potatoes in the Simla Hills; we interstripped them with the local variety, and farmers were convinced; later we did the same with other crops. But that is not enough for Government demonstration purposes; in many cases continuity of work on the spot is required; also in a *tehsil* the *tehsil* farm will be the headquarters of the Agricultural Assistant. This is important, as you require some definite place at which the zamindar knows he can get into touch with the Agricultural Assistant, somewhere where the Agricultural Assistant can store his excess of implements, seeds, or whatever it is he wants to store. There also he can do a little demonstration on his own lands and show the farmers any particular thing in which they may be interested. A number of things can then be done by the Agricultural Assistant which he could not very easily do on the zamindar's fields just when and where it suits him best. My point is that demonstration farms have their functions.

42,092. So you propose to keep on demonstration farms?—Our idea is to wait and see how far better farming societies can take the place of *tehsil* farms. I personally await the results of the trial with great interest.

42,093. *Professor Gangulee*: Have you sent any students from your college or any officers from your department to Pusa for post-graduate training?—Quite a number.

42,094. Have they come back?—Yes.

42,095. Would you like Pusa to develop into a post-graduate institution?—The main function of Pusa should be research. If you have a staff of high class researchers at Pusa you will have people going from the Provinces to Pusa for the privilege of studying under these high class researchers in their particular subjects. When a man wants to know a particular line of work he will go to the man who knows it best and get tuition under that man.

42,096. Would you like Pusa to be affiliated to any University?—I think it would be a sound thing; it would give Pusa a better status.

42,097. You say that agricultural education is of value in all Government departments. Do you suggest there that the subordinate revenue officers or irrigation inspectors should be recruited from among the agricultural graduates?—What exactly do you mean by subordinate officers?—

42,098. You say that agricultural education is of value in all Government departments. I ask you whether your suggestion is that you would like to recruit your subordinate officers, say tahsildars or co-operative inspectors or irrigation officers, from the Agricultural College?—At the present moment we have two posts of *zaildars* reserved in the Irrigation Department for men from the two years' leaving certificate course; I would like to see that kind of man taken into the Irrigation Department in greater numbers than is the case to-day; similarly with the other departments.

42,099. With regard to research, are you satisfied that there is a continuity of research work in your experimental farm or in your laboratory? That is, whenever an officer undertakes a certain item of research, does he carry it through, whatever the result may be, positive or negative? Do you finish a piece of experiment when you take it up?—There is no question of finishing. I worked on cotton for many years; it is now being carried on from the point where I left it, and there is no doubt that somebody else will carry it still further. There is no real finality in many of these problems. In the old days when research officers were very few, each man had a number of research problems to carry out. We had people from all parts of the Province calling for something to be done, and each poor research worker had

a dozen other things to attend to. As we are gradually getting more officers we get them to take up one or other of the vast number of problems which are calling for attention.

42,100. In your reply to Sir Ganga Ram you said that you were carrying on some experiments with regard to dry farming in *barani* tracts; what is the nature of those experiments?—Conservation of soil moisture, suitability of crop selections to *barani* tracts, and that sort of thing.

42,101. You are going to see the relationship between the soil and the moisture?—Different methods of cultivation is carried out in different plots lying side by side for comparison; the effects of manures and things of that sort are also tested.

42,102. Do you follow a definite plot technique?—I have issued a letter recently trying to bring plot-testing work on different farms more into line with each other than previously.

42,103. Would you agree it is very essential to have a standard technique and definite methods in field trials?—Yes, very essential.

42,104. With regard to the publications which you mentioned in answer to Sir Thomas Middleton, are these publications very popular among the people? Is there any great demand for them?—Yes.

42,105. Do you supply these publications through the co-operative societies?—We supply them to a good many people who ask for them. We hand over large numbers of these publications to the Co-operative Department when they hold their big meetings.

12,106. We had evidence before us pressing for some sort of legislative measures for both cattle breeding and for cattle protection. Could you tell us if the various members representing the agricultural interests in the Council have drawn the attention of the Legislature to this question?—I do not think so.

42,107. Have any of these problems come before the Council at any time?—I do not remember any.

42,108. *Mr. Calvert*: You discussed with Sir Henry Lawrence the benefits to the Province of the large farms in the canal colonies. Have these large farms had any effect on other large landowners?—We find the large landowners are about the most difficult men to move. They have usually got a good deal of money and are usually less inclined to move than smaller men; but there is no doubt there are many now who are taking a vast amount of interest in the development of their estates; for example, we have had calls for Agricultural Assistants to manage their lands from a number of people and that is a sign of the people coming round; the fact is they have seen that their lands can be made to yield more money. They are also keen to get more money.

42,109. But are the large landowners, i.e., the big grantees, taking to farming their lands themselves on similar lines?—You will find cases where they are pushing ahead with more up-to-date methods. There are quite a number taking a keener interest in agriculture than they did years ago and the number is increasing rapidly.

42,110. *Mr. Roberts*: I may say that I have constantly two or three men being trained in our large estates in our place?—I am glad that Mr. Roberts has got some men in training because it is very difficult for us to lend our men to private farmers. What farmers have asked for from me has been men who are in service with four or five years' experience, and it is extremely difficult for us to lend a man for a long period of years and then take him back to the department giving him his seniority over others in the department and a post of trust for which he has not had the necessary experience.

42,111. With regard to these three sections, Agriculture, Veterinary and Co-operation, do you not think that if these were partly under the control of the Development Commissioner it would enable you to get a better perspective and the difficulties with the Finance Department would be less? You have got to look to the future where these departments would compete with one another for funds?—That is one of the reasons why the Veterinary Department should not be divorced from the Director of Agriculture. I do not want any friction or competition to occur between them.

42,112. *Mr. Kumar*: I want to have cleared up one point, and that is with regard to this dual purpose milking animal which we are trying to evolve. In this country the buffalo is a better milker and people depend on buffalo milk. She gives about 8 to 10 lb. of milk per day. Now, when you have succeeded in evolving a cow capable of giving 10 lb. of milk a day, would you be in favour of eliminating the buffalo?—Yes, to some extent. If the farmer's family want the milk and if they can get it from the cow which is breeding young bullocks at the same time, it will certainly reduce the number of buffaloes.

42,113. So there should be an attempt to eliminate the buffalo and replace it by the cow?—I doubt if we can ever eliminate the buffalo altogether, but we might do a good deal to give the farmer his supply of milk without having also to keep the buffalo.

42,114. Is it possible to eliminate the buffalo from this country?—It will be very difficult.

(The witness withdrew.)

DIAGRAM SHOWING THE LINKS BETWEEN THE VARIOUS OFFICERS AND STAFF OF THE AGRICULTURAL AND VETERINARY DEPARTMENT.

* In capacity of research workers have direct access to the Director of Agriculture.
Note 1 (*a*).—The Superintendent, Civil Veterinary Department, North Punjab Circle, supervises the veterinary work of the North-West Frontier Province and reports direct to the Chief Commissioner, North-West Frontier Province. The remaining veterinary staff of the North-West Frontier Province has no other connection with the Punjab.
(*b*) Both the agricultural and veterinary work in the Delhi Province are supervised by the Punjab staff.

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Mr. C. F. STRICKLAND, I.C.S., Registrar of Co-operative Societies, Punjab.

Replies to the Questionnaire.

QUESTION 2.—*Agricultural Education.*—The majority of students who have taken an agricultural degree in an agricultural college aim at securing a post in government service, and I believe that in this province the number of such posts is sufficient to employ the majority of the more successful students. It should, however, be possible to return a larger number of these men to duties of practical agriculture on an independent footing, if they were trained for several years, after the completion of their college course, on farms of considerable area, e.g., 100 acres each, in order to fit them for the post of manager under big landholders. The latter do not at present employ men whose knowledge of agriculture is in their opinion largely theoretical. A scheme of practical training for a term of years on these lines has been under consideration in the Punjab, and has, I believe, been approved.

Students who have taken a shorter course, such as the six months' vernacular course at Lyallpur, are similarly aiming at government service, and so long as there is no great excess of them (*mukaddams*) above the needs of the Agricultural Department, it is difficult to persuade competent youths to accept private employment. The co-operative better farming societies, now being founded in the Punjab, desire to employ trained *mukaddams* who have passed through a six months' course at Lyallpur, but I am doubtful whether any but the lower grade students will accept duty under a co-operative society, unless they are also shown on the cadre of the Agricultural Department. In my opinion the remedy is to train a greatly increased number of *mukaddams*, exceeding the needs of the Agricultural Department; we shall then in the end be able to obtain good men for private employment without bringing them on to the official cadre. In the meantime the better farming societies should be given *mukaddams* from the permanent cadre of the Agricultural Department.

QUESTION 4.—*Administration.*—(*a*) *Government of India.*—The International Institute of Agriculture in Rome is concerned in a disproportionate degree with European and North American agriculture, and at the Congress of 1926 much regret was expressed at this disproportion, and a separate bureau of tropical and colonial agriculture was founded in the institute in order to remedy it. It was, however, pointed out by the officials of the Institute that they have no person whom they can question in matters of Indian agriculture or rural conditions. The British permanent delegate, whose services are employed by India, is not ordinarily acquainted with Indian conditions, and a strong desire was expressed for the appointment of a permanent resident delegate from India. I agree with this demand. Some articles on Indian affairs which have been published by the Institute from time to time on behalf of individuals (Indians and Europeans) who do not reside in India, have contained curious errors and anachronisms. It was also pointed out to me with much force that the presence of a permanent delegate, acquainted with Indian conditions of the present day, in the Institute would have been of utility to this Royal Commission, which would have been able to obtain comparative information illustrative of Indian problems. He would also be able to explain to the officials of the institute the meaning of the questions put to them. They point out that it takes five or six weeks to obtain an answer to their inquiry as to the exact intention of a question asked of them, whereas a permanent delegate would be able to answer it forthwith. If a pensioned official were appointed to the post, the cost would presumably not exceed £500 per

annum, but if it is desired to send a younger man, official or non-official, from India, the cost will be greater, but he will be more closely in touch with current questions.

The difficulty in using at present the International Institute of Agriculture is that the Institute does not know what information India has to give or what information India wishes to receive. In April, 1926, when I made more inquiries from officials of the Institute and the permanent delegates of other countries as to the comparative conditions of small-holders in India and Europe, I found the former, i.e., the officials, very largely ignorant of the economic status, the manner of life, and the legal tenure of the Indian peasant, while the permanent delegates tended to reply that data of the kind which I wanted could be obtained but had not been collected because they had never been demanded. My inquiry referred particularly to the nature of the crops grown by small-holders near market towns and at a distance from them, and the extent to which they grew commercial crops or lived on the produce on their own land. There will in my opinion be a number of such comparisons and investigations which could be made, on the initiative of a permanent delegate, with advantage to India and to other countries. Important analogies and differences will be found between small landholders of India and Egypt, Scandinavia and the Low Countries.

In addition to information as to facts, the Institute could be highly useful to Indian administrators and politicians in supplying a comparative study of methods. The various uses to which forest products can be put, the principles of land colonization, with particular reference to interspersal of large and small holdings, which are beneficial to one another, the best lines of conducting an investigation into village conditions, and the procedure and difficulties of carrying out a census of production, would be relevant to questions which are often debated in this country, and with regard to which the Institute should certainly be questioned. The study of literature published by the Institute is not sufficient, since it is not directed towards Indian needs and Indian conditions. The Institute is always ready, within the limits of its staff and its means, to make inquiries and answer references of a special nature from constituent countries.

It appears to me that a particularly valuable form of reference might be made, when legislation on rural and agricultural subjects is contemplated in India, in order to discover how the same problems have been treated in other countries of the world.

The recent Congress proposed to amend the constitution of the Institute in a manner which may eventually involve India in liability for a higher annual subscription, if she wishes to remain in class II of members, whereby she enjoys four votes and pays eight units of subscriptions. If this small (possible) increase in expenditure is not accepted by the Indian authorities, the Institute will suffer financially, and in my opinion India will be failing in an international duty.

QUESTION 4.—ADMINISTRATION.—(*b*) *Provincial Governments.*—It is uneconomic for each province separately to attempt to give, to a small number of students, an advanced course in a technical subject. I understand that the principle, that such work should be undertaken by the Government of India, is accepted in theory, but I wish to draw attention to a singular application of the theory. The Imperial Institute of Animal Husbandry and Dairying at Bangalore started in 1925 a three months' course in co-operative dairying. It was attended, I believe, by about twenty students in all, of whom eight (all graduates) were sent by me from the Punjab. They studied the principles of stock breeding, the treatment of cattle, the qualities of the different breeds throughout India, the properties of milk, casein, &c., the methods of co-operative dairying in Europe and America, and the best lines of advance in India. The course was of a specialised and

technical kind, which cannot possibly be given by any institution in the Punjab. The Lyallpur College contains a small herd of 20 or 30 cows and some simple dairy machinery, whereas Bangalore has comparatively large herds of cattle from all parts of India, advanced plant for the treatment of milk and other products and a skilled staff of livestock experts. My officers who attended the course reported most favourably on it, and their knowledge has been of great utility during the subsequent year. It has, however, now been ruled by the Government of India that this class should be discontinued, on the ground that the central government should only undertake courses of a technical and advanced nature, which are beyond the powers of a provincial government. The course in question is, however, of an advanced and technical nature, and precisely such as should fall within the central government's definition of its own functions. The Lyallpur College can offer me nothing in the form of a dairying course, to which I should think it worth while to send men of the graduate standard. A number of my matriculate subordinates are attending a vernacular course at Lyallpur, such as the staff and apparatus of the college enables it to give. I am anxious to see the Bangalore course renewed, and I suggest that provincial susceptibilities should not be allowed to interfere with it. Moreover, the number of students from the whole of India is not likely to justify more than one such course in the whole country.

QUESTION 4.—ADMINISTRATION.—(*c*) *Other Departments.*—(v) A large increase in the number of rural post offices is required, and the power to receive and dispatch insured letters should be given to as many as possible of them. There is at present great difficulty in transmitting co-operative money. The Punjab Government has in recent years been refunding to co-operative societies three-quarters of the money-order commission paid by them on remittances between societies, but is now contemplating the withdrawal of this concession. The cheapest method of remittance, if the refund is discontinued, will be to send notes by insured letter, but there are at present very few post offices in the rural areas which can dispatch an insured letter.

(vi) I should be glad to see a broadcasting installation which would supply intelligent and educative information to the villages. I understand that such a system was recently suggested by the British Government to the Government of India. I have no doubt that if the subscription for a receiving installation were moderate, e.g., not above Rs.100 per annum, a very large number (say 10,000) of the Punjab villages would willingly subscribe this amount. It could be used for the supply of agricultural information, but its greatest value would be to keep the villages awake and alive. The greatest evil in rural life in this province is its dreary dullness.

QUESTION 5.—FINANCE.—(*a*) I have dealt with this point more fully under question 22, concerning co-operation. I wish here only to give a warning against the idea of providing agricultural credit by non-co-operative means, such as the Agricultural Bank of Egypt. I visited this bank and several other non-co-operative mortgage banks in Egypt in 1924, and was impressed by the great danger of placing easy money within the hands of small cultivators, often illiterate and usually unpunctual, unless they are controlled by local associations of their own fellows which will guard them against imprudent borrowing and negligence in repayment.

QUESTION 5.—FINANCE.—(*b*) The issue of *taccavi* to cultivators in the form of direct loans from government under the Agriculturists Loans Act is now becoming obsolete, and should be abandoned in the case of all villages which have a co-operative credit society of more than two years' standing. The same comment applies, though with less force, to loans under the Land Improvement Loans Act. Loans from government should be given through the agency of central co-operative banks, so far as concerns villages which

have a co-operative credit society. No control should be exercised over the rate of interest which is charged by these institutions. The apparent rate of interest is largely in favour of the direct loan from government, but unless the distributing officer is extremely watchful or his subordinates are unusually upright, the actual cost to the borrower largely exceeds the apparent rate of interest, and it is found that small cultivators prefer to borrow from a co-operative society at what appears to be a much higher rate of interest.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) A cultivator borrows on account of (*a*) the uncertainty of agricultural harvests, (*b*) his occasional need for large sums of money, e.g., for trade, the education of children, or the purchase of land, and (*c*) ceremonial requirements, litigation, extravagance and speculation in (his own) agricultural produce.

(ii) The sources from which he borrows are (*a*) the moneylender, who is often also a grain-dealer or shopkeeper, (*b*) the broker in the market, (*c*) the cattle dealer, and (*d*) the co-operative credit society.

(iii) He is prevented from repaying by (*a*) the unsound system of credit which is favoured by the moneylender and the broker, i.e., loans for improper purposes, compound interest, undue laxity with regard to repayments, (*b*) the secrecy and disorder of the creditor's accounts, and (*c*) his own illiteracy.

I have discussed these point more fully in the Punjab Memorandum to the Royal Commission, pages 188 to 217.*

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*b*) Apart from the encouragement of co-operative credit on sound lines, I advocate an amendment of the Usurious Loans Act, whereby an agriculturist will be empowered to come into court and demand a settlement of his account with his creditor by a less complicated method than the present civil suit for settlement of accounts. It should then be compulsory for the judge to examine the history of the dealings between debtor and creditor for a certain number of past years, to reckon the amount which is equitably due, irrespective of any acknowledgments or admissions made by the debtor during that time, and then to give a decree against the debtor, with payment by instalments. No further interest should accrue, so long as the instalments are being paid. Effective legislation on these lines has been passed in the Kashmir State, and it should not be difficult to insert in the Usurious Loans Act. The present Act is totally ineffective, because (1) the initiative lies with the creditor, who does not wish for a settlement, (2) the fixing of reasonable instalments is not compulsory. The subordinate courts in India are hard pressed by work, and it is not human to expect them to devote time to the examination of old accounts and the consideration of the real results of the decrees given by them, unless they are required to do so by precise enactment.

I would also extend the provisions of the Punjab Redemption of Mortgages Act beyond the limits of Rs.1,000 and 30 acres, to which it is at present confined. It is desirable in this country to facilitate the redemption of mortgages by transferring possession as early as possible to the mortgagor who wishes to redeem, and leaving the mortgagee to prove his claim to further relief. This can always be given by a short-term mortgage, granted by the civil court, if the former mortgagor, who is now in possession, does not make a cash payment.

Special action for the relief of debt is necessary in distressed areas, such as the Muzaffargarh District in the Punjab, and in the province of Ajmer-Merwara. There is a point of indebtedness, at which the moral fibre of the debtor is so impaired that he cannot be relieved by co-operative credit. A summary system of debt settlement, whereby the amount which the debtor can pay will be assessed, and reasonable instalments fixed, is required

* Not reprinted.

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in such areas. It will be necessary to limit the debtor's right to dispose of his land and produce until he has paid off the liability. This involves a measure of official control, which is very distasteful to government, but the duty cannot in my opinion be evaded. I have specially examined the conditions of the two areas of which I am speaking.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*c*) The Punjab Alienation of Land Act, which has been applied also to the North-West Frontier Province, Delhi and Ajmer-Merwara, has been of great value and has effected the primary purpose for which it was intended namely, to prevent the transfer of land from the agriculturist to the non-agriculturist classes. It was not intended to protect the small holder against the large owner, and its failure to do this, if it has failed, is no argument against it, but this evil is to be met by other means. In all such legislation, however, it is essential to include in the law certain precise issues, which a civil court is required to strike and decide in every suit in which a breach of the restriction is likely. Unless this is done, the civil courts, which are over-worked, will occasionally overlook the rule.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) See question 22 on Co-operation.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*b*) The chief obstacle to consolidation is the distrust of the subordinate revenue staff, to which it appears necessary to entrust the work, if it is to be carried out on a large scale.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*c*) Such legislation is desirable and would facilitate the work.

QUESTION 8.—IRRIGATION.—(*a*) (ii) In Ajmer-Merwara the majority of the irrigation tanks are suitably controlled by government or a local body, but there appear to be a certain number of uncontrolled tanks, in most cases out of repair and out of use, which could with advantage be managed by co-operative irrigation societies if technical assistance were given to them from time to time by an engineer. The attitude of the Government of India in this matter is reported to be that these tanks are not worth maintaining or will continue to break down. The cultivators in some cases hold a different opinion, and if they wish to put their tanks in order without asking the government to finance them, it would appear reasonable that government should give them sympathetic assistance.

QUESTION 10.—FERTILISERS. (*f*) Cowdung will continue to be used as fuel until other fuel is available. It is not so used, or is used less freely, in hilly tracts where wood is abundant. The remedy is therefore to provide more wood, and for this purpose Government should grant a remission of land revenue for land afforested in all low hills and all areas of the plains. It does not appear practicable to convey either wood or coal from remote places to every village of the plains. Local wood must be provided. A grant-in-aid of plantation is less effective than a remission of land revenue, because the cultivator obtains the full benefit of a remission, whereas a grant of money does not in all cases reach his hands without a reduction in its amount.

There is no real difficulty in teaching the man (or woman), who has been accustomed to cook his food on a fire of dung cakes, to substitute wood as fuel. A villager who migrates from the country to the town learns to cook on wood in a very short time. The reason why wood is not used, where it is available, is conservatism of the people, which is not sufficiently countered by instruction in the value of dung as manure. Mr. Brayne of Gurgaon has met with a measure of success in his attack on the use of dung-cake as fuel, which he has now carried on for six years. I look upon

the rural community councils as an agency for propaganda of this kind. They should encourage dramas such as that shown in the Gurgaon District, in which the practice of making dung-cakes is most amusingly reprobated.

QUESTION 11.—CROPS.—(*a*) (iv) Damage by wild animals can be prevented by fencing. It is possible either to enclose a large tract of land, belonging to many owners, or to consolidate the land of each owner and let him enclose it separately. So far as wild animals are concerned the former method is the more economical, but since tame animals have also to be taken into account, the second method is equally useful wherever consolidation has been effected.

Legislation should enable the majority of a village community to compel a minority to accept a scheme of enclosure, and should also authorise the imposition of a small annual contribution for its maintenance.

The provision of fire-arms is not really effective. They are sometimes misused, but are for the most part not used at all and are retained as a mark of dignity only.

QUESTION 14.—IMPLEMENTS.—(*c*) The ordinary village smith cannot repair improved agricultural implements. Local bodies, collaborating with implement makers, should send a travelling lorry to rural centres, with an instructor who would teach village smiths how to repair the commonest breakages. Similar instruction to smiths is being given by the Rural Community Council of Kent, and if the rural community councils of the Punjab can be financed, they would perhaps be the best bodies here also.

QUESTION 15.—VETERINARY.—The Civil Veterinary Department should be independent of the Director of Agriculture. To place the doctors of animals under the Agricultural Department is as irrational as to place the doctors of men under the Director of Industries. In my opinion the Civil Veterinary Department in the Punjab at present is cramped and should be placed in a position of greater freedom.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) For the improvement of live stock, I recommend the institution of official herd-books in the areas where the best breeds exist, and the branding or tattooing of all recorded animals. Tattooing in the ear is preferred by Hindus to branding with a hot iron. The registration of sales of cattle will not only hamper theft of cattle, but will assist in tracing the pedigree of good animals.

I have already referred under Question 4 to the need of restoring the class in co-operative dairying at the Bangalore Institute of Animal Husbandry.

Milk recording should be encouraged. There are groups of co-operative milk-recording societies in the Punjab, which are only partially successful because the peasants cannot be persuaded to wean their cattle. Government gives an annual grant-in-aid to the Punjab Co-operative Union, which appoints the recorders and organises the societies through its staff. There should, however, be a system of small cash grants to the owner of every calf which is weaned from the moment of birth, its mother remaining alive.

Reference is made under Question 22 to co-operative cattle-breeding societies.

QUESTION 16.—ANIMAL HUSBANDRY.—(*b*) The day of common pastures in the Punjab plains is past, and such open pastures, without stint of numbers, are now harmful. They spread disease, exhaust the grazing, and kill the best animals which require the most food. I advocate the partition and cultivation of all such pastures in the plains. I see no hope of persuading the entire village to stint its common pasture, or to allow a co-operative cattle-breeding society to enclose and control a proportionate part of the

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common pasture. When the enclosed part had been improved, the non-member owners would refuse to continue the arrangement. We must, therefore, induce cultivators to set aside and enclose and control a portion of their own private lands. A remission of land revenue should be granted to cultivators who arrange for such control on a system approved by the Civil Veterinary Department and the district authorities. I do not anticipate that the control will be satisfactory or permanent unless the members are united in a co-operative society for the purpose.

In Ajmer-Merwara, and in those parts of the Punjab and of the North-West Frontier Province where hillside pastures are available, it seems more possible to persuade either a whole village to limit the number of stock on the land or to set aside a certain portion by partition for the use of a co-operative cattle-breeding society. The pressure on the grazing ground is less heavy than in the plains. In these tracts I advocate a similar concession as regards land revenue.

QUESTION 16.—ANIMAL HUSBANDRY.—(*d*) Attempts to persuade cultivators to store their fodder (straw of cereals or stalks of hot-weather crops) either jointly or separately, with an agreement that the store shall not be used until the society resolves that a time of scarcity has arrived, have not been successful in this Province. An attempt is now being made in the Attock District to popularise village silo pits, and I consider that this method should be followed. The cultivator is hard to convince, but if Government will establish experimental pits in every village, the cultivator's cattle will themselves convince him when the pit is opened. Argument is not effective; the cultivator requires demonstration, and the demonstration must be at his home, not at an agricultural farm.

The contracts for grazing grounds or grass enclosures (*rakhs*) on hillsides should also be given by preference to co-operative cattle-breeding societies. Unorganised groups of villagers cannot be relied upon to handle them properly, while a contractor will sell impartially for good and bad cattle. Fodder should be given by preference to good cattle, such as those maintained by a cattle-breeding organisation.

If Government intends to create fodder reserves in the Nili Bar Colony or elsewhere, a preferential right to the fodder should be given to cattle which are entered in the herd-books, or which have been entered in the registers of a cattle-breeding society for not less than six months before the commencement of the scarcity.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*c*) The chief obstacle is the lack of experts to teach such minor industries. In an illiterate country of small holders, it cannot be said that the attempt to create such industries has ever been made until a competent teacher has been employed for a term of years. A Fruit Expert has recently been appointed in the Punjab, and a Silk Expert is working in the Gurdaspur District. Co-operators have not been able to assist the silk expert to a large extent, because the work is done in sheds at a distance from the homes of the workers. The industry of silkworm rearing will not be successful until it is done in the homes of the workers. The co-operators are interesting themselves in the work of the new Fruit Expert.

A further obstacle is social prejudice (rather than caste prejudice), which prevents cultivators from undertaking the charge of poultry.

Perhaps the biggest obstacles of all is the general corruption which prevails among the subordinate staff of hotels, hospitals, colleges, etc., to which poultry, eggs, honey, etc., might be sold. I do not anticipate success unless producers are able to set up their own retail shops in a town, and a retail shop requires much money and is difficult to organise if it sells only one class of goods.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*h*) The improvement of health should be taught by rural community councils, which should organise health associations. Co-operators in this Province are doing their best also by means of co-operative better-living societies, to which reference is made under Question 22.

The difficulty in rural community councils, in India as in England and Ireland, is financial. The Punjab Government makes a grant to the Rural Community Board which is the central body of the councils I consider that a similar grant should be made by the Government of India to promote a Rural Community Council in Ajmer-Merwara.

QUESTION 19.—FORESTS.—(*b*) I have referred to the substitution of firewood for cowdung in my answer to Question 10 (*b*). The formation of large forest reserves by Government in the plains is beneficial to the towns rather than to rural areas, since the contract for the sale of wood from large reserves will ordinarily be taken by a contractor, who will naturally seek one large market rather than a number of petty markets. Firewood in rural areas must be grown by the local population, who can be induced to do so by a remission of land revenue.

QUESTION 19.—FORESTS.—(*c*) Soil erosion, due to the denudation of the lowers hills, is general in the submontane districts of the Punjab, the North-West Frontier Province and Ajmer-Merwara. The remedy is re-afforestation, which is expensive and should not be expected to give an immediate or direct return in cash. It pays Government and the country in the end, by preventing land from falling out of cultivation. A skilled staff of engineers, rather than of foresters, is needed to show where and how afforestation, embankment or planting should be carried out. Skilled advice in planting is valuable, but not so essential as skilled advice in embankment. When a plan for the draining of a ravine or a flooded channel has been drawn up and mapped, a remission of land revenue should be granted on areas reserved by the villagers or areas planted by them. The co-operative organisation appears to be the simplest, but it may be possible to achieve the same ends otherwise.

A careful study of the position is more urgently necessary in Ajmer-Merwara than in the Punjab, but the ravines are small and numerous, the work is consequently uninteresting, and for various reasons it is sometimes less easy to obtain money for works of development from the Government of India than from provincial governments.

QUESTION 20.—MARKETING.—(*b*) The great evil in existing markets for the sale of grain and of raw cotton is the untrustworthiness of the weights and measures used. There should be official cart-weighbridges, officially stamped weights and measures, officially stamped beam-scales, and a regular inspection of them all by an employee sufficiently highly paid to be moderately honest. A few markets in the Southern Punjab and in the neighbourhood of Delhi enjoy the benefits of old weights and measures stamped by the district authorities more than a generation ago. I believe that the stamping is in most places no longer carried out, but that the old articles are in use. They are of great benefit to the producers. Model by-laws for the use of local bodies have been prepared by the Punjab Government, and passed by a number of municipal authorities and one district board. They provide for the purchase of a standard set of weights and one measure from the Mint, and prohibit dealers from calling by certain names any weights and measures which do not agree with these standards. So far as I have discovered by careful inquiry, these by-laws are totally ineffective, because (1) the public does not know of their existence, (2) the customer cannot entrap the shopkeeper by asking him to specify the precise name of the weights or measures which he is using, and (3) there is no system of inspection. Legislation

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which does not face the facts is not only without value but harmful. There should be prepared at the public expense standard weights and measures for sale to the public, duly stamped and regularly inspected, and the use of any other weights or measures than these should be forbidden (1) in all markets, (2) in all municipal areas, and (3) by progressive degrees in the villages also.

QUESTION 20.—MARKETING.—(*c*) I advocate the erection of elevators for the collection and grading of grain for export, both at markets up-country and at the ports. Up-country elevators are of little value without elevators also at the ports. They should all be under the management of the railway, in order to concentrate responsibility for the grain from the moment it leaves the hands of the producers to the time of actual shipment. I realise that in the years in which there is no export of grain the elevators will do little business and will possibly work at a loss.

QUESTION 22.—CO-OPERATION.—(*a*) The most important functions of government as regards the co-operative movement in India are—

(1) the education of the people as regards the real meaning and principles of co-operation;
(2) the audit of the societies or the supervision of such audit;
(3) more direct assistance to new and untried types of society;
(4) miscellaneous concessions.

The functions of a non-official agency should be—

(1) propaganda in those types of society which are no longer experimental;
(2) the supervision of existing societies;
(3) if the audit is not carried out by government agency, then the audit of societies under the supervision of government;
(4) the education of the public;
(5) finance.

In the Punjab the financing of societies is almost entirely carried out by central banks and the Provincial Bank, which are non-official bodies. The Registrar is, however, President of the Provincial Bank, to which Government has, with the approval of the Legislative Council, given a guarantee of interest on certain debentures for a term of years. Government on the other hand, has hitherto financed the co-operative mortgage banks and has placed a small sum of money annually at the disposal of the Registrar to meet unexpected emergencies or to assist the weaker institutions such as the Co-operative Industrial Bank formed by societies of artisans. The money held by co-operative societies in this province from Government is at this moment not more than Rs.4 lakhs in a working capital which exceeds Rs.5 crores.

Audit of primary societies is carried out by the sub-inspectors of the Punjab Co-operative Union. These auditors are non-officials, appointed and paid by the union, but working under the general control of the Government inspectors. The arrangement, which appears somewhat illogical, is found to work with reasonable efficiency. The central banks and a few of the largest primary societies are audited by chartered accountants. The appointment of every auditor, whether a servant of the union or not, is subject to the approval of the Registrar in accordance with Section 17 of the Act.

The system prevailing in several provinces, whereby the audit is done by servants of Government, is supposed to ensure greater accuracy and responsibility, but unless Government is willing to appoint a staff for inspection and education as well as for audit, the function of inspection and education is then left entirely to non-officials, who if paid, and if fully competent, would throw a greater burden on the finances of the societies, and if unpaid, appear

to work with less regularity and sometimes with less sympathy than an official inspecting staff.

There is, therefore, much to be said for the Punjab system of Government-paid inspectors, who are usually graduates and who undergo a subsequent training of over a year before appointment to a circle. They submit to an examination which is estimated to attain the M.A. standard. I have no desire to criticise other provinces, but I do not think that the system of non-official inspectors and educators secures men of the same calibre.

Propaganda, except in the case of experimental types of society, is entirely carried out by the staff of the Punjab Co-operative Union.

The concessions granted by Government consist of the remission of income-tax except on income from Government securities, exemption from stamp duty and registration fees, the privilege of remitting money from one bank to another by remittance transfer receipt through the treasury, and (during the last ten years) the refund by the local government of three-quarters of the commission paid by co-operative societies on money orders used by them for the remittance of co-operative money. The remittance transfer receipt facilitates the dispatch of money between the higher institutions, while the rural societies use the money order system.

In answer to other questions I have suggested the remission of land revenue, rather than grants of money, to societies which undertake certain works of public utility, such as the enclosure of pasture.

A great privilege would be conferred on the societies and on the agricultural population at large, if central co-operative banks were permitted, in districts which have no branch of the Imperial Bank of India at headquarters, to open a personal deposit account in the treasury, to which they could credit sums received by them on account of land revenue, instead of having to pay the money to the subordinate treasury officials in cash, with the consequences which are inseparable from the activities of low-paid officials.

The relations between the official staff and the non-official agency of the Punjab Co-operative Union are harmonious, and the allegation frequently made that co-operation in the Punjab is official-ridden proceeds in my opinion from persons who have not studied the Punjab system at close quarters.

(*b*) (1) *Credit societies.*—The measure which would help the co-operative societies of this province more than any other is legislative provision to make the ordinary money-lender keep clear accounts in an intelligible form, and communicate them periodically (without demand) to his debtor. Attempts to limit interest by legislation have been unsuccessful throughout all history, and I do not recommend them.

As explained in my answer to question 6, I would enable the debtor to take the initiative in using the Usurious Loans Act, without waiting for movement by the creditor, and would provide for a compulsory examination of the previous accounts and for fixing reasonable instalments without interest.

Special measures to deal with rural insolvency are required in depressed areas, such as Ajmer and the Muzaffargarh district of the Punjab, where the destitution and the moral enfeeblement of the agriculturist render it impossible to relieve him by co-operation alone.

(2) *Purchase, and* (3) *Sale.*—In my answer to question 20 I have discussed the necessity for standard weights and measures, supplied by authority and inspected by authority. Our great difficulty at present is to convince the zamindar that when a co-operative sale society weighs one maund, it means one maund, whereas in the case of a number of other agents it may mean 30 or 35 seers. The enforcement of the by-laws regarding pure food, especially milk, by local authorities, would be very helpful. In some areas there are

excellent by-laws, but their enforcement is not always regular, and the agency which is intended to enforce does not always operate in the manner which was intended.

(4) *Societies for improvements.*—I have recommended compulsory legislation to deal with recalcitrant individuals who obstruct or refuse to join in societies for afforestation, enclosure, or the building of tanks. I have also recommended the remission of land revenue in such cases.

(5) *Consolidation societies.*—The Punjab Government supplies a special staff for this work, which at present numbers six inspectors and 70 sub-inspectors. They are drawn from the subordinate revenue staff, and are paid at a substantially higher rate than they would receive on their ordinary duty. We are, therefore, able to insist on industry and integrity. The agriculturists do not appear to favour the use of the ordinary revenue staff without such special provision for their correct behaviour, but it may be argued that the ultimate advantages of consolidation outweigh the injustices which might result from wholesale use of the revenue staff with compulsory powers. I am inclined to suggest the introduction of compulsion in limited areas, especially those in which the people are advanced and intelligent. We have in the Punjab redistributed 60,000 acres in five years, though the staff has not been so large as at present during this period.

I recommend the remission of the mutation fee, as in the Punjab, for the entry of the results of consolidation in the revenue record, and I would legislate to provide that in the event of a subsequent suit by the reversioners of a widow, or a minor on his majority, or an absentee on return to his home, against the results of a voluntary consolidation proceeding to which his representative, who was at the time in possession of the land, had consented, the redistribution should not be upset in the event of the success of the suit, but cash compensation should be given.

(6) We have no societies for the use of agricultural machinery in the Punjab, and I do not foresee a likelihood of their creation, unless tube-wells can be proved to be successful in the hands of small cultivators.

(7) *Farming societies.*—We have five in the Punjab, which are working with indifferent success. A more useful line of advance appears to be the formation of better farming societies, which are now about 100 in number, and to some of which the Agricultural Department is giving vernacular trained men (*mukaddams*) for a term of years. They take the form either of a farm of about 30 acres, which is cultivated by one or more special tenants, or an extensive area of 2,000 acres, cultivated by the members themselves. The present method of giving trained workers to such societies appears to be sound. The cultivator believes more fully in results obtained on his own land under his own supervision than in results obtained on a government farm. He is incurably suspicious.

(8) The societies for the breeding of cattle and sheep, which are at present about 200 in number, obtain their bulls and rams at very moderate rates from the government farms, but the district boards, which pay a part or the whole of the price of the bull, are not willing to allow such societies to confine the use of a selected bull to the stock of the members of the society, though local bodies in Europe habitually act on this method. It is unsound to allow a bull to waste its strength on unselected stock, when a method of selection is open to the whole village.

I should be glad to see all animals, which are entered in a herd-book or are registered by a co-operative stock-breeding society, branded or tattooed, and a system of registering sales introduced.

The most important reform is, however, a limitation of the number of bulls which may cover cows in a given area. I found this system at work in North Ireland in 1924, and I observe that it has subsequently been

introduced in the Irish Free State. It was being actively discussed also in Sweden. Most of all it is desirable to control the release of bulls by pious Hindus with a view to acquiring merit. Whatever merit may be acquired, the result of the action on other persons does not always appear to be borne in mind, and if a bull of inadequate size and mongrel stock is released to do its worst, the entire neighbourhood suffers. I do not believe that a courageous provision to deal with this evil would cause excitement for more than a few weeks. I would let a man release a bull as an act of virtue, but it should be approved as fit for covering the stock which it may cover.

(9) There are in the Punjab four types of societies for general improvement--

(1) Co-operative adult schools,
(2) Co-operative societies of compulsory education,
(3) Arbitration societies,
(4) Better living societies.

The adult schools explain themselves and do work of mixed value. They have often a short life, but that does not mean that they have not achieved a useful purpose. In the three other types, the members pledge themselves to educate their children up to the end of the 4th standard, to refer all their disputes to the societies for arbitration, and to carry out such rules of moral, social and hygienic improvement as may be approved by the general meeting. No help from Government appears at the moment to be required.

(*c*) Yes.

(*d*) In the Punjab I consider that 25 per cent. of the societies are thoroughly good and are rapidly attaining their end, 50 per cent. of the remainder are useful but are working more slowly, and the other 25 per cent. are not at present doing work of value. It is for the continuous education or the liquidation of the latter that the Government staff, as well as the staff of the non-official Punjab Co-operative Union, is required. I am quite satisfied with the proportion of success.

The Province of Ajmer on the other hand is in a less satisfactory condition. The societies have in the past been controlled by central banks of an urban temper, and inspected and audited by a largely non-agricultural staff, which is neither fully sympathetic nor fully trained. The assistance given by the Government of India has been proportionately very much less than that given by the Government of the Punjab, and the burden laid upon the societies of this extremely impoverished area, in order to support their staff, has in my opinion been excessive. A more generous attitude would be justified. In particular the services of agricultural experts would give great help to the societies, a special staff for consolidation societies is required, trained agriculturists might with advantage be supplied, as in the Punjab, to do practical work in better farming societies, and concessions should be made with regard to societies for enclosure or for the construction and repair of tanks. From the co-operative point of view the Province of Ajmer Merwara needs liberal treatment, in view of its special difficulties.

Co-operation in the North-West Frontier Province has recently been started, and has been placed under the Registrar of the Punjab. The Government of India has here assumed a liberal attitude, and a good beginning has been made.

Co-operation in Delhi Province is also under the Registrar of the Punjab, and here also reasonable assistance has been given. Co-operation in Ajmer Merwara has been working longer and has reached a point at which its needs cannot be compared with those of the North-West Frontier Province or Delhi.

Mr. C. F. Strickland.

QUESTION 23.—GENERAL EDUCATION.—(*a*). I do not think that the education of the rural classes should be considered so much from the point of view of agricultural efficiency as from the point of view of human development. Under certain conditions it is possible for a miserable specimen of humanity to be reasonably efficient (under supervision) in agricultural work. The defect in our rural education is that it is planned by urban men, given by urban men, supervised by urban men, and examined by urban men, to a very large extent. This peculiarity is found in many countries, but owing to the wide divergence of interest and difference in point of view between the urban and the rural population, the evils which result from it are more obvious in India than elsewhere. The village school boy is taught by a master who is often a resident of a town and dislikes the country, or if originally born in a village, is frequently of the shop-keeping or money-lending class and has little knowledge of agricultural pursuits or sympathy with the cultivator's outlook. The school is inspected by able and industrious officers, who often suffer, in a greater or less degree, from exactly the same limitations. The text books which are studied are still, despite recent improvements, concerned to a considerable extent with urban life, and are full of urban histories and instances. The laudable ambition of the school-masters is to prove their own efficiency by so educating the boys that they can pass at least the primary standard and can be encouraged to continue their education in a secondary school. The prize which dazzles their imagination is that by attaining the standard of matriculation or a school-leaving certificate they can secure a small post in Government employment, and if they proceed further to the University, may secure a high post.

In my opinion the remedy is to draw a large percentage of the teachers in the rural elementary schools from the cultivating classes, and to reserve a minimum percentage of admission to both the normal schools and the higher training colleges for individuals of the same origin. We should thereby secure a larger proportion of such men among the inspecting officers, though it is impossible to carry the principle of reservation higher in the profession.

As regards text books I would continue the process of replacing urban matter by rural matter, directing the attention of the rural student to objects which surround him and to conditions with which he is familiar. The abler student from the intellectual point of view must go on to a higher school, and will of course become urbanised, but with rural text books and a rural master there is no reason why the village boy should not become more alert in mind and more receptive of new ideas than at present, without feeling that all the good in the world is in the towns and thereby so changing his outlook that he returns to agriculture only because he sees no hope of other occupation. Closer relations and closer sympathy will be established with the rural pupil by a teacher who is himself rural in mind and outlook. In many countries, including England, a number of rural teachers are keen gardeners, naturalists, bee-keepers, poultry-keepers, &c., and some of them become authorities in the neighbourhood in such advanced matters as the judging of cattle, crops, &c. Agricultural co-operation in Rumania was originally organised by a group consisting largely of school-masters. The Folk High Schools of Scandinavia, while teaching very little agriculture, stimulate in the rural mind the love of both country and countryside, while enlivening and widening the interests of their pupils. Such an influence appears to be rare in India, and can only be established by drawing a teacher from a class which will understand, sympathise with and maintain a rural outlook.

I do not advocate the teaching of agriculture in elementary schools, and I am doubtful of its value in Anglo-vernacular middle schools. I have not sufficient knowledge to criticise the vernacular middle schools to which

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small agricultural farms are at present attached, but I think that they also suffer to some extent from the tendency of the teacher to be urban in outlook, and of the abler teacher to prefer urban surroundings. Rural high schools should be created in the villages, not only in the market towns or in a headquarters of a district. Farms should be attached to them in which the pupils would carry on practical agriculture. School gardens are in my opinion sufficient in elementary schools.

QUESTION 23.—GENERAL EDUCATION.—(*b*). The Primary Education Act should be applied more generally and with more courage. Government should not shrink from the infliction of the penalties authorised by the Act. In some areas the compulsion is at present partial and there is timidity with regard to enforcement. Co-operators in their co-operative societies of compulsory education do not shrink from imposing penalties, and the withdrawal of a member on whom a penalty has been imposed is very rare. Our impression is that all the more advanced districts are ready for a general extension of the compulsory principle. Such outery as there might be would proceed from persons who are either a small minority in the villages or are residents of the towns and have no real knowledge of rural conditions.

QUESTION 25.—RURAL WELFARE.—(*b*). The Punjab Board of Economic Inquiry is carrying out a number of intensive investigations into selected villages, and the results in a few cases have been published or are in the press. The investigator is a graduate on Rs.150, and spends at least a year in the village itself. The results are interesting and useful, but would be much better if the Board had a trained and permanent staff. This is impossible without an assured income. The Board at present lives on an annual grant from government, and I consider that a guarantee with regard to the continuity of this grant should be given, in order that permanent investigators may be engaged. The report of the recent Economic Inquiry Committee, appointed by the Government of India, shows that the Punjab method was in general approved and was the basis of their recommendations.

Extensive inquiries are more difficult than intensive and offer greater opportunity for error and for hasty conclusions. The greatest necessity in all economic investigations is for thoroughness and caution. It is, therefore, imprudent to employ other than practised investigators, working under trained economists.

Oral Evidence.

42,115. *The Chairman*: Mr. Strickland, you are Registrar, Co-operative Societies, Punjab?—Yes.

42,116. You have provided the Commission with a note of the evidence which you wish to give. Would you like at this stage to say anything in amplification of that note or to make any corrections?—I have no corrections to make. I want to amplify one part of it, page 297, Question 20 (*c*), on the subject of elevators. Since writing that, I have been considering the question as to the extent to which the holding of the grain which was in the elevators could be assisted by the co-operative movement, and I discussed it briefly with the Agent of the North Western Railway and with a man in Karachi who is a representative of a firm, by name Mr. Buntin. He used to be in the Irrigation Department. As I understand from Major Gordon's report, the amount which we hold at any one time in the Punjab, whether for export or for internal use, is approximately 400,000 tons on an average, representing a value of about 5½ crores. I see no difficulty in the co-operative movement readily expanding and taking a large part in the finance of holding the grain up to that figure. I have taken the opportunity during my visit to Delhi of consulting the Manager, Northern India Branches of the Imperial Bank,

who has given me a letter authorizing me to say that the Bank will be prepared to make advances against elevator certificates for graded grain, provided that the certificates are so drawn up as to be legally valid and transferable by endorsement, Government to be responsible for the grain up to the time of final delivery. I only wanted to add this in order to explain that the co-operative movement could go a long way in this direction of finance.

42,117. Your suggestion is that the co-operative movement might carry out the primary collection, and the co-operative society would hand over the grain to the up-country elevator and obtain certificates from it?—Yes, I am thinking primarily of working through the co-operative commission shops where the ownership of the grain remains with the individual and does not pass to the shop, but the shop would give him an advance against his certificate, and would in its turn obtain an advance from the Imperial Bank.

42,118. While on this question of grain elevators, I should like to draw your attention to the words which you have used on the same page. You say: "Up-country elevators are of little value without elevators also at the ports." Do you not think that if the expense involved in undertaking this movement of grain elevators has to be justified, it can only be justified on the internal trade, that is to say, on the trade for wheat for internal consumption in India?—I do not quite understand the expression "it can only be justified on the internal trade."

42,119. Economically it is only likely to pay if you can set up your grain elevators with a view to handling wheat for the internal trade?—I do not see why one should exclude from consideration the export trade. I am afraid that I have not quite grasped the point.

42,120. The balance of wheat available for export year by year is very uncertain?—Yes; it averages from 700,000 to 800,000 tons.

42,121. And occasionally it falls very much below that?—Yes.

42,122. On the other hand, the demand for grain for consumption in India is relatively stable?—Yes.

42,123. And it would be just as feasible for the grain to be drawn from the Punjab for consumption in the great centres of population by means of grain elevators as it would be to deal with wheat for the export trade by grain elevators; and, indeed, it appears to be the view of those who have applied their minds to this problem that it is only if grain elevators can pay on the basis of the trade for internal consumption that, financially, elevators at the ports can be justified. I only wanted to draw your attention to the fact that you lay great emphasis on the export trade, whereas in fact it is trade for internal consumption?—It seems to me that in this country elevators are wanted for the export of grain, since exported grain requires to be graded, more than grain consumed within the country. It is always dispatched to a distant and open market which causes the exported article to be standardized and improved, and this holds good also in America and elsewhere.

42,123A. Do you know that graded grain is said to be wanted for the Indian mills also?—No, and I am surpised to hear it. I have always regarded the Indian consumer as indifferent in the matter of quality.

42,124. What I want to suggest is that if 400,000 tons is about the average that will have to be held at any time, then the loss of a bad year will be compensated for by the gain of a good year, so that it ought to be a paying proposition if calculated on the basis of the export trade only. Turning now to the first page of your note of evidence, you say that a scheme of practical training for a term of years on these lines has been under consideration in the Punjab, and has, you believe, been approved. That is to say, a scheme of practical training designed to equip men for employment as managers, and so on? Will you tell us a little more about this?—I was speaking of the

scheme which I expect Mr. Milne has already described to you, the Shergarh scheme, which I heartily support.

42,125. We have read with interest your views as to the desirability of appointing a permanent delegate to the International Institute at Rome. What calibre of man do you require for that office?—If you are going to take a retired employee, then I imagine that he should be a man who has held a very high status out here, somewhat comparable with people like Sir John Elliot, who was the British representative. I understand that the present British representative is a man who was taken from the Civil Service at Home and of lesser experience.

42,126. What pay do you imagine would have to be given?—If you take a retired official, even a senior man, you might secure him for £500, but if you take a man, of any position, from India, you will have to give more.

42,127. You say, in dealing with this matter of the International Institute at Rome, that the recent Congress proposed to amend the constitution of the Institute in a manner which may eventually involve India in liability for a higher annual subscription if she wishes to remain in class II of members. I think it is the case that the increase of subscription to which you refer has been approved by the Government of India?—I did not know that; all I know is that it has been approved in principle by the Institute itself, but that it has not yet been necessary to levy it.

42,128. In your answer to Question 4 (*b*), you lament the discontinuance of the dairying course?—Yes, I feel very strongly on that matter.

42,129. You suggest that provincial susceptibility should not be allowed to interfere with efficiency in that direction. Is it in fact due to provincial susceptibilities?—That is what I gathered from the reply of the Government of India to the Punjab Government.

42,130. What was their attitude in the matter?—The Government of India said they should only undertake advanced courses, but this is an advanced and technical course to which only graduates were sent, so that it was a post-graduate course, and consequently one which the Government of India should undertake.

42,131. With regard to your answer to Question 4 (*c*) on page 291 which deals with rural post offices, may I know whether the cases which you are thinking of are cases in which representations have been made and where it is supposed post offices might reasonably be installed without undue loss to Government?—No, but the general attitude of the Post Office always is that the post office must pay its way before it is created.

42,132. Your view is that it creates its own demand?—Yes; and it must do it slowly.

42,133. I am interested in your note on broadcasting. Have you thought out the question of programme at all?—It will all depend on the size or area over which you are broadcasting; I do not think the language question for four Divisions in the Punjab and a good deal of the Frontier Province would create much difficulty. You can adopt a simple form of Urdu or Punjabi which will be understood.

42,134. But difficulties will arise occasionally, I suppose. For instance, many people in Scotland occasionally complain that they cannot understand the English. Difficulties like this are apt to crop up?—Yes, I myself have experienced that difficulty. But speaking of the Punjab, I think that as most of the villagers understand simple Urdu, though they do not speak it, and if broadcasting is done through simple Urdu it will be understood by most of the villagers.

42,135. *Prima facie* it looks as though broadcasting would be by far the most effective means of educating and awakening interest?—Yes, they would

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simply love it in the villages, because village life is so dull; I think a good deal of the rural crime in India is due to boredom, just as it is in England and elsewhere. People have nothing to do after dark.

42,136. On page 291 you give us your views about the principle of providing agricultural credit by non-co-operative means, and you cite the example of the Agricultural Bank of Egypt. You tell us that you do not think that that principle should be applied in India. Would you provide us with rather a fuller note on that subject?—Yes, I will.

42,137. There is an idea abroad in certain quarters that in order to ease the lot of the cultivators you have got to provide him with ample credit on easy rates. You do not agree with that view?—You destroy him absolutely. That is exactly what happened in Egypt.

42,138. On page 291 you are dealing with the matter of *taccavi* loans, and at the end of your remarks you say: "The apparent rate of interest is largely in favour of the direct loan from Government, but unless the distributing officer is extremely watchful or his subordinates are unusually upright, the actual cost to the borrower largely exceeds the apparent rate of interest." Is there abundant proof of that?—It is very difficult to bring it into a Judicial Court, but it is true all over the country. We find instances where members of our society borrow at 12½ per cent. from the society to repay a Government *taccavi* loan which is nominally at 6¼ per cent. Let me give an instance. I was conducting an economic investigation in a village, and received a request for help in obtaining Rs.400 for sinking a well. I sent it straight to a high officer, and it was granted in a week at a cost of Rs.17, of which only Rs.5 was illegitimate. They told me that if they had gone through the usual channel they would have spent a year in obtaining it, and it would have cost them Rs.50. The year may be an overestimate; I should say six months.

42,139. On page 292, in answer to Question 6 (*b*), where you are dealing with agricultural indebtedness, you express a view that in some districts debt has reached a point where it cannot be dealt with by ordinary means, but that steps must be taken to declare an area and to take Government action to clear the matter up. Would there be any difficulty in the actual delimitation of such an area?—I do not think so, because it need not apply to everybody in the area. You could make it apply from village to village, or you could make it in some cases optional for people to come forward if they wished.

42,140. Would it not affect the credit of people in the declared area, although they might not themselves be in any great difficulty?—It might, but I think that should be ignored in view of the great advantages to be gained. With regard to my reference to Ajmer-Merwara, I ought to mention that the Registrar of the Punjab is also the Registrar of Delhi and the North-West Frontier Province, and acts in an advisory capacity for Ajmer-Merwara.

42,141. You say the subordinate courts in India are hard-pressed by work, and it is not human to expect them to devote time to the examination of old accounts, and the consideration of the real results of the decrees given by them, unless they are required to do so by precise enactment. You think they would be able to undertake the work which you suggest should be put on them?—I think so.

42,142. On page 293, in answer to Question 6 (*c*), you are dealing with the Punjab Alienation of Land Act, and I gather you consider that on the whole that Act has proved a success?—Villagers say it is the one thing that has saved them.

42,143. I take it that Act does comply with the desideratum you lay down, namely, that such legislation should include the precise issues which

the civil court is required to decide?—I do not think it is needed in that particular Act, because that Act is an act of prohibition. Where these things must be fixed is in a positive enactment. For instance, in the Pre-emption Act, whenever a person comes forward claiming pre-emption against someone who has bought certain land, it is compulsory on the court to fix issues to the effect: "Is this contrary to the Alienation of Land Act?" It has to fix the issues without any initiative on the part of the parties.

42,144. How far do you agree, when you are attempting to consolidate a village in which the holdings are seriously fragmented, that it is wise to pass along, if you meet one or two obstinate people?—I think there are now areas where we might proceed to compulsion.

42,145. You think public opinion is sufficiently with you for that?—In certain areas.

42,146. There again would you declare a definite area?—Yes. I would pass an Act saying that compulsion may be used. I am not at the present moment attempting to discuss the details, but this Act might be applied by notification to any area the local Government thought fit. It could be applied gradually.

42,147. I have one supplementary question on irrigation. Do you see any hope of coming to an arrangement whereby water may be charged for on a volumetric basis to a group of cultivators organised co-operatively?—The obstacles appear to be very great. We have prepared several schemes, and found several Irrigation officers willing to support them, but there has always been someone in the scale of authority who would not support them, and from whom the obstacles appeared to arise. A Superintending Engineer may agree, but his subordinates do not. Sometimes people below are willing to try the method, and then the obstacles appear to arise higher up. We have a large file in my office dealing with the point. There are obstacles always.

42,148. Do you think the Irrigation Department is willing to make the experiment?—Some men are and some men are not, and as a consequence there is always someone who is not.

42,149. Would you like to develop at all the view you express on page 294 in answer to our Question 15, that the Civil Veterinary Department should be independent of the Director of Agriculture?—I am not in a position to say very much on that. We find in our co-operative cattle-breeding and milk-recording societies that we have continually to turn to the local Veterinary Assistants rather than to the local Agricultural Assistants. I do not question the claim of the Agricultural Department that the agricultural expert has had a training which covers animal husbandry in a wider sense than the veterinary man, but in practice the agriculturist never touches an animal in the majority of cases after he leaves college. We, therefore, turn direct to the Veterinary Department, and I should like to see that department extended to include cattle-breeding. I heard part of the evidence given by the last witness, and I should like to say that in my opinion friction would be reduced in that way. It would certainly be a help to co-operators.

42,150. On page 295, in answer to Question 16 (*d*), you say: "Contracts for grazing grounds or grazing enclosures (*rakhs*) on hill sides should be given by preference to co-operative cattle-breeding societies." What is the nature of a contract of that sort? What do you mean by a *rakh*?—A Deputy Commissioner sometimes has certain hill areas under his control where they are not in the hands of the Forest Department, low hills. He declares them open, or gives them out on contract from time to time. I think for a year as a rule. One Deputy Commissioner has helped us very

much by giving grazing contracts to co-operative societies which charge so much per head to their own and other cattle.

42,151. Are most of these areas covered by scrub jungle?—Yes.

42,152. The same officer controls the taking of firewood?—I think so. It is ten years since I was a Deputy Commissioner, and I do not really remember.

42,153. On page 295, in answer to Question 17 (*c*), you say: "Co-operators have not been able to assist the Silk Expert to a large extent, because the work is done in sheds at a distance from the homes of the workers." Why is the work carried on at a distance?—Because it must be done where mulberry trees exist, and so far they have only been planted on the banks of the canals. Since I wrote that, I have been in touch with my local officer on the point, and he tells me that in two villages now ground has been selected and trees are being put in, the intention being to start silk societies there. I think we can go further on those lines.

42,154. Have you examined the possibility of attempting to extend the poultry industry?—We have tried to organise a few egg-selling societies and we have come hopelessly up against the subordinates. The natural body to supply the eggs to is the hospital or a hotel, but the manager cannot attend to the matter himself, and one has to go to the *khansama* and pay him.

42,155. How about the market in Europe and America for dried eggs, and so on? Do you think that might be explored?—It seems to me to come both logically and in practice after the local market. It would want much bigger plant and more skilled management. It would be much more difficult to do co-operatively at the present time.

42,156. On page 296, in answer to Question 20 (*b*) on marketing, you say: "There should be prepared at the public expense weights and measures for sale to the public, duly stamped and regularly inspected, and the use of any other weights or measures than these should be forbidden." Would you make the manufacture of those weights and measures a Government monopoly?—It could be done by private persons licensed by Government, or Government could inspect them before sale. The thing would automatically happen if you forbade the use of others.

42,157. You would have to take steps to compel the withdrawal from use of existing scales and weights?—I would not confiscate them. I would merely penalise the use of anything which was not stamped. It is of great importance from the point of view of agriculturists, and others too, in this country.

42,158. Are there many systems of measurement in vogue in the Punjab?—About one every ten miles. I investigated that in the Jhelum district, when I was Sub-Divisional Officer there, and in an area of 60 miles I found six different *topas*, which are the measures by which grain is often bought and sold.

42,159. As you are aware there has been an enquiry within recent years into the possibility of clearing up the confusion. Do you think public opinion is ready for a move in that direction?—I think public opinion in that direction, and in several others in matters of this sort, is much more advanced than people sitting in Simla realise. I do not mean any disrespect to Government by that. If you go out into the villages you discover how very much the people in this Province have changed in the last ten years. They are ready for a lot of things. They would squeal, but would accept it in six months, just as they would the enforcement of British weights and measures.

42,160. You give us some interesting views on general education on page 301 in answer to our Question 23 (*a*). You are anxious that teachers drawn from

rural classes should be assured of a minimum number of places in Normal schools and higher training colleges. How far do they remain rural in the sense in which you wish them to, if they are trained at these institutions? —It depends on the quality of the institutions. Normal schools are now being made into very vital and human institutions instead of being merely instructional. There is a Normal school at Gakhar where the students are kept going at the double all day long. That means that although the atmosphere may not be rural, it is decidedly not urban. It is not the sort of thing we mean by urban, which often means that people become heavier in their figures and softer in their habits. If you put these men under the right sort of discipline, they will remain much more open-minded and sympathetic than the ordinary routine allows an urban man to become. I hasten to say of course that there are urban men who are excellent.

42,161. If a man from a rural area went to a Normal school in a town and had a reasonably comfortable time and found himself less comfortable when he came to the village, he might draw his own conclusions as to the relative attractions of town and country, might he not?—Yes, and for his own convenience he might wish to go back to the town, but some of them might also think that something should be done for the country.

42,162. How far is this view founded on experience, that it is possible to take a man of the rural classes, put him through a normal school, take him back to the country, and find that he is really rural in his outlook? Practically no direct experience at all; it is only my own opinion formed as the result of going about and talking to various people.

42,163. You say rural high schools should be created in the villages; would the idea be a village high school serving a group of villages?—Yes, I mean the ordinary high school with a different curriculum but with exactly the same ultimate standard of education, though not perhaps the same subjects; it would be right out in the jungle, not associated with a town.

42,164. I was wondering how many ordinary villages it would take to justify the setting up of a high school in a small village?—It would extend over the surrounding area, and it would have to be to a large extent a boarding institution, as most high schools are.

42,165. What are they in fact? Are they mixed boarding and day schools? —Yes, I believe I am right in saying that; I know many are, and I think they all are.

42,166. In answer to Question 22 (*a*), on your own subject, co-operation, you give us some interesting views. How far are you satisfied with the touch that exists between your own department and the Agricultural Department?—We are in constant touch. What I do feel is that if the Agricultural Department were also, I was going to say, more rural, it would be a good thing; but even some of the urban men in the Agricultural Department we find very helpful; we find them helpful on all points really.

42,167. But you do notice a distinctly urban flavour in the Agricultural Department?—There is apt to be. For instance, every year I receive a list of men who have passed out from the Agricultural College who want to be co-operative inspectors, but I have to reject most of them on the ground that they have never been in a village or seen one.

42,168. Then you set out the most important functions of Government with regard to the co-operative movement. Do you set these various points down in the order of their importance? Would you regard education in its widest sense as being the most important function of the co-operative movement?—No, I put them down in order of chronology; you must deal with education first.

42,169. Do you regard education as perhaps the most important?—It is the most fundamental; you can do nothing without it.

42,170. You point out that in the Punjab the financing of societies is almost entirely carried out by Central Banks and the Provincial Bank, which are non-official bodies. You, as Registrar, are President of the Provincial Bank: who, as a rule, fill the chairs of the district banks?—In the majority of cases, in at least four-fifths of the central banks as distinguished from the unions, the nominal chairman is the Deputy Commissioner, but he only as a rule steps in in a crisis; he often attends committee meetings, but does not take a great part, and some Deputy Commissioners do not attend meetings.

42,171. Are you satisfied with the type of men who man your boards or committees or whatever you call them?—They are not ideal, but we have most excellent public-spirited men; we have some townsmen, pleaders, &c., and most capable men who come forward from the villages. I am not satisfied with the accountants and managers as distinct from the Directors. I have been hammering at that for two or three years; it is very hard to get the banks to pay up for a good man.

42,172. Is the organisation in those two respects improving?—Yes, very much; we are now ordinarily paying a manager from Rs.100 to Rs.150, whereas four years ago it was more like Rs.50 to Rs.60.

42,173. I suppose your department at all points is in very close touch with the Union?—Yes, it is in touch with the head Union in this way: I am the President, but I have very little to do there; I have not time for it. The actual functions of the Registrar are carried out, so far as he has functions, by the Deputy Registrar; he holds no status as such; he is simply acting as an agent of the Registrar; but his work is being reduced from year to year in favour of the secretary, who is a graduate and a lawyer, and is now carrying on a great deal by himself.

42,174. To what extent do your sub-inspectors really assist in the management of primary societies; what is their relation to the ordinary primary society?—Their primary function is to audit; apart from that they should do nothing in an "A" class society at all; an "A" class society is only audited. In a "B" class society the sub-inspector may go and harangue the members and advise, but he may not do anything himself; he may not draw up the demand, he may not assist in recoveries, he may not prepare the papers to proceed against a defaulter, I was going to say, unless the society is entirely illiterate, but we have changed that, and if they are illiterate, they go down to "C" class.

42,175. May he be present when an applicant for a loan is making his case?—Yes, and I suppose they very often do refer to him; but he has no authority in the matter.

42,176. Is there any risk involved in that right to be present on such an occasion?—Yes, there is the risk that he may interfere, but I think it would be impossible to exclude him. In any event you could not get the order enforced if you could not watch him.

42,177. What salaries do most of the Sub-Inspectors receive?—From Rs.50 to Rs.90. I have been speaking of the good societies; in the weaker societies, the bulk of which are class "C," he is allowed to assist in making the crop demand, and assist in recoveries, but he may not handle the cash under pain of dismissal. He is allowed to encourage and invite them to proceed against defaulters and in general to correct their accounts in a way in which he would not be allowed in societies of classes "A" and "B." We always try to impress upon the people that the sub-inspector is their servant, and I think that idea is growing.

42,178. I have heard no suggestion in this direction at all, I merely ask whether there is any risk that, considering his relatively small pay, a sub-inspector might in the case of a weak society be in a position

to improve his own lot at the expense of members desiring loans?—In a weak society if he wants to do anything improper he does not do it in that way: he persuades the treasurer to give him Rs.200 to send by money order to the Central Bank and does not send it. We have had a number of prosecutions; that is inevitable in a large staff.

42,179. Have you ever had it suggested that sub-inspectors make improper demands on applicants for loans?—I have not heard that particular suggestion.

42,180. On the whole, of the two alternative methods, general supervision by Government paid staff as against supervision by persons acting in honorary capacities, as exists in certain other Provinces, you definitely prefer the system in vogue in the Punjab?—I like to have the honorary man in wherever we can get him, but you cannot expect the honorary man to give all his time.

42,181. There is no reason why both these systems should not be worked together?—No; we have honorary inspectors and honorary sub-inspectors.

42,182. I take it that the great advantage of your system here of Government paid inspectors is that you are sure of getting men who are properly trained?—That is really the whole thing; it is most desirable to get a properly trained and educated man, and also in the majority of cases our man is so burningly keen and that makes him honest.

42,183. Are you satisfied, broadly speaking, with the present policy in the matter of the granting of *taccavi* loans in so far as it affects the vigour and spread of the co-operation movement?—I do not think it affects us at all, it is too small. *Taccavi* is a very small amount from year to year; I think it is becoming unnecessary wherever a co-operative society exists unless Government is prepared, as it reasonably may be, to advance money to thriftless and dishonest persons to whom the co-operative societies will not make advances. Government have better methods of summary recovery and they can do that and it may be better to keep these people cultivating their fields than starving. *We* cannot touch them.

42,184. On page 300, you mention the co-operative adult schools; we have heard a great deal about the possibility of extending, or, where it has not been commenced, initiating adult education. What is your view of this movement? Is it proving a success?—The adult schools as run by the Education Department are becoming a great success; we are now practically withdrawing from that field or we are only just carrying on the original propaganda and then handing the adult school over to the Education Department. It seems to me to be most successful, provided you give the people something to read after you have educated them.

42,185. Why are you withdrawing?—It is too big for us; I think in all these cases where we are stepping into the field of another department, we should only carry on the early work and then when we have shown that the thing can be done we should withdraw, unless there is any particular reason why we can do it better than others. My people are not fit to inspect schools.

42,186. It appears that one of the advantages of conducting adult education on a co-operative basis would be that you would not give your facilities until you were sure of your demand?—You mean that you would have no eye-wash. I do not know, I cannot get my staff to agree to charging a fee. I do not myself believe in any adult school where a fee is not charged unless you have constant supervision by the Education Department. I cannot give that supervision; my people are too busy. I think there is a danger of eye-wash.

42,187. Have you many members who borrow from credit societies and also borrow from moneylenders?—Yes, quite a number, especially in the weaker societies; we gain ground slowly, but it takes a long time.

Mr. C. F. Strickland.

42,188. Are your members punctual in repayments, on the whole?—On the whole, yes; we have arrears. If I remember rightly our total repayments last year were about 150 lakhs, while the total arrears outstanding were 39 lakhs. That includes cases in which the whole loan is in arrears because we are going to liquidate the society.

42,189. Do these figures represent an undue percentage of overdue payments?—No, these figures are very satisfactory. I should say that less than half of the 39 lakhs represent real overdues on the crop; a great deal of that is paid up in the next month. I might just explain one point further: we have accepted a very high standard in one respect in the Punjab in order to secure uniformity throughout India. The Registrars' Conference in January 1926, in Bombay held that the date for calculating arrears should be the date on which the loan is finally due; that happens in our case to be the last day of the year; so that if a loan is one day overdue, it is shown in the annual report. In most of the other Provinces that is not so, but we need not be afraid of that.

42,190. You see no reason why the co-operative movement should not continue to grow, do you?—It ought to grow very largely.

42,191. If it does and if it takes over more and more from the moneylender the function of providing the cultivator with the necessary credit, do you think there will be any difficulty in getting the necessary funds?—We have only temporary shortages; at the present moment we are overflowing with surpluses and if we raised the rate of interest I feel sure that we should raise a crore of rupees in a few months. I see no difficulty in the immediate future. Our shortages are due to the fact that our increase in the number of societies exceeds our average rate of increase of funds.

42,192. For instance is the co-operative movement being lent money by the successful shopkeeping class?—In the Central Banks, yes. We get very little by way of deposits in the primary societies; that is natural; they are hardly literate in some cases, but the Central Banks are drawing to a very large extent from the educated townsmen; they are trying to a very great extent to get the doctor, the lawyer and also the shopkeeper in the towns.

42,193. So that you are also to some extent educating the better-to-do public in the matter of investing their money?—We are trying to make them realise that it will pay better to earn 6 or 7 per cent. which is safe than 25 or 30 per cent. which is unsafe. We have not won the village shopkeeper yet, the village moneylender. I do not think we are securing his money.

42,194. *Mr. Calvert*: You have about 20 lakhs of deposits from non-members in village societies?—Yes, that is nothing, out of the 10 crores that we are using. 10 crores is the total capital of the movement. If you cut what is counted twice it will come to about 6½ crores.

42,195. *The Chairman*: Could you say that the activities of the credit societies have had the effect of reducing the rate of interest demanded by moneylenders in the areas in which the societies are working?—Not very much I think. I think that it does so during the first year of a society; but after that the people split into two classes for the most part, those that are going to deal with the society and in many cases the moneylender will not lend them money at any price, and the others who will not come into the society.

42,196. Do you look for expansion largely in areas where there are few societies at the moment or do you think that the movement would expand mainly in areas where it is now strong?—It will expand in all places.

42,197. Do you think you are in a way near the point where the moneylender is going to find it difficult to place his available capital?—No; he

will always find other outlets without any difficulty as the country becomes gradually industrialised. Other sources of investment are open to him. Sometimes inconveniences result. I have been told that where societies have worked well for some years the shopkeepers have all gone out of the village. The shopkeepers have gone away and the villagers complain they cannot get a pinch of salt now.

42,198. When the directions in which he is accustomed to lend his money disappear, you will come to the point where the moneylender's assets are drawn into the movement. That, I suppose, is the ideal towards which you are working?—Yes.

42,199. *Sir Henry Lawrence*: In these *mandis* that are so common, is there any provision by the Post Office to attract money into the Savings Bank?—You mean to ask whether there are Post Office Savings Banks in those places?

42,200. In a certain *mandi* in the Central Provinces we found that the local Municipality had made arrangements by which the goldsmiths were given premises inside the *mandi* so that the ryot when he sold his produce converted it straight away into ornaments. It is suggested to us that it would be a good thing if the Post Office did the same thing, had an office inside the *mandi* so that the ryot might be induced to put some of his money into the Savings Bank. Is that idea followed in this Province either by the Post Office or by the Co-operative Society to secure money from the ryot the moment he obtains it by the sale of his produce?—Not so far as I know with regard to the Post Office. The ordinary member of a commission shop in a *mandi* is also a member of a credit society, and in one district in which our commission shops are most fully developed the Central Bank, when lending to a primary society, makes the condition that all the members of that society who receive loans from the society shall sell their crops through the commission shop; the result is that directly he gets his money he goes straight to his village society and repays there, or in some cases it is credited by the commission shop to the credit of the society, but never reaches his hands at all. If he likes he can draw some of it and not the whole. We have never made any other special arrangements.

42,201. That is a valuable measure to secure the money for the co-operative movement; is that commonly done?—I believe that it is done on a large scale in the Lyallpur district. I think I shall probably be at Lyallpur when the Commission is going to see the commission shop there, and can make inquiries.

42,202. Where it is in existence it works well and it might be done on a bigger scale; is that your point?—It has never been suggested by my staff that there is a great need for it. The ordinary man who has sufficient intelligence comes to a commission shop. In many cases, especially in the Canal Colonies, where most of these shops are, he is anxious to pay off and he does not squander the money.

42,203. Is not the absorption of gold and silver in the Punjab going on on a large scale?—Yes.

42,204. Probably more than in any other Province in India?—I do not know; but it is going on a large scale.

42,205. So that there is a big source if that is tackled?—Yes. We are trying to have better living societies which attempt to restrict all kinds of extravagance, including the making of ornaments.

42,206. On page 292 you mention that effective legislation has been passed in the Kashmir State in regard to debts. Have you seen the terms of that legislation?—Yes.

42,207. Is it capable of adoption in the Punjab?—Yes, but I am not sure whether it would be effectively used. It is rather a difficult point to discuss,

but if one could feel that this matter would be insisted upon by the higher judicial authorities who inspect the subordinate courts it would be effective, that is if they pay special attention to it and see that it is being acted upon.

42,208. That is the Usurious Loans Act?—No; you asked me whether this legislation of the Kashmir State could be applied to British India. If such legislation were passed in British India, it would be effective if first of all the form of the law compels the subordinate judicial staff to enforce it and, secondly, if the superior judicial authorities would see that the orders were carried out.

42,209. Are you apprehensive that the superior authorities are not seeing that the provisions of the Usurious Loans Act are being carried out?—I do not think anybody knows that it exists. It hardly exists at all. I have been speaking to one subordinate judge after another, and they always say first one thing and then another, and I had written to them after examination saying the objection is not true; I have written to one or two of them after consulting legal experts, but I have not received an answer. It is not enforced; it is not compulsory because the initiative does not lie with the debtor.

42,210. I do not quite understand that?—I should like the debtor to be able to go into the court and sue his creditor for a decree to be given against himself, and it should be compulsory on the court to apply the law as it is in the Kashmir legislation. It should be compulsory on the creditor or rather the court to give him instalments for repayment.

42,211. Could you let us have a copy of the terms of this legislation?—The Registrar of Co-operative Societies in Kashmir is present here, and I think he might be able to give it to you.

42,212. You could obtain it and send it to our Secretary?—Probably I could.

42,213. On page 293 you say: "The chief obstacle to consolidation is the distrust of the subordinate revenue staff." What kind of mischief is perpetrated ordinarily? Is it corruption?—I think there would be great fear of corruption and partiality. The best land in the reallotment might go to those persons who made it worth the while of the redistributing man.

42,214. But does not the final consent rest with each person to whom the offer is made?—Yes, in co-operative consolidation. But I thought that this Question 7 (*b*) referred to carrying it out through some other staff. I am not quite sure what the idea of the question was. When writing that I meant that, if the work is to be carried out on a large scale, it would not be possible to do it co-operatively; we could not find time to deal with it.

42,215. On page 296 you suggest that more wood must be provided, and you suggest that remissions of land revenue should be granted for land afforested in the plains. Is there any system at present in force to encourage zamindars to afforest areas?—In certain areas where the land is subject to erosion there is a system of remission, but I should like to see it extended elsewhere.

42,216. There is no general system recognised by the Government?—I think I am right in saying that there is not.

42,217. You point out that it is absolutely necessary?—I think it is most important. At the present moment manure is being used for fuel.

42,218. You do not advocate that the Forest Department should take up and manage these small plantations for village facilities?—I should be content to see it done by the Forest Department. I do not think it matters so much by whom it is done, but I should be glad to see it done. I think I ought to mention in that respect that anticipating a question of this kind, I had an enquiry carried out in the last month by my

Inspector in Changa Manga in the Lahore District. He enquired in every village, and he found that they burned no more wood than if the plantations had not been there. They could obtain a large quantity of wood at a very low price, and they did not do it. Curiously enough, there is one village which has a private plantation. They did use the wood, but others did not buy from the Forest Department.

42,219. In the Madras Presidency, the village panchayats are encouraged to manage small wood reserves of this kind. Would it be possible to have any such system here?—I should certainly like to try it, and I have at the present moment under discussion a scheme, originated by Mr. Brayne, of Gurgaon district, under which there would be village plantations on a co-operative basis; but it is not very easy to make the people realise hat they should put down the money for a thing which will give them a return after fifteen years; that is what the Forest Department tell me it will take before a profit is earned.

42,220. In Mysore—individual zamindars grow these small wood plantations and get a return after, I think, five or six years?—I have consulted the Chief Conservator, and he told me it was fifteen years.

42,221. At any rate the need is recognised and you think Government should take some steps in that direction?—They certainly should. When I say remission of land revenue I do not mean merely revenue *on* the land afforested, but in *proportion* to the land afforested; it might be on the total revenue of the village.

42,222. *Mr. Barron*: There is probably no revenue from the land afforested?—No.

42,223. *Sir Henry Lawrence*: Such a system is in force in the neighbouring backward Province of Sind.

On page 294 you speak of pastures and you say that their day in the Punjab plains is past. By what method do you suggest that zamindars should breed their own cattle?—I should like to see zamindars in the plains allotting to a cattle-breeding society such proportion of the common grazing ground as falls to the lot of its members. Then they would enclose it and make it into a pasture. I have already approached the Punjab Government with a scheme to the effect that if a cattle breeding society does anything of that kind it should receive a remission of land revenue.

42,224. Remission of land revenue seems to be the panacea suggested for everything?—Yes, I think that is the best way you can do it, because grants of money may not arrive in full at the place for which they were intended, but a remission is not subject to deductions.

42,225. Stall feeding is not practised anywhere, is it?—Very rarely if at all; I have heard of one or two cases only. I believe the Agricultural Department do not recommend that practice very much, or at any rate on a large scale, because of the danger of weakening the bone of stock that are intended for draught.

42,226. It has been stated in the Bombay Presidency that the finest cattle are bred when they are stall fed?—I am not an expert on that point, and therefore not in a position to answer that question competently.

42,227. So far you have escaped from any large cases of fraud in your co-operative banks?—They recur from time to time. We have just had one in a Central Bank to the extent of Rs.27,000 exposed, and that was because we happened to have the same treasurer as the Government had. He embezzled our money as well as that of Government.

42,228. But you are satisfied that so far as is humanly possible safeguards are taken against any extensive system of frauds?—Yes, I do all I humanly can; but I cannot say that the Directors of Central Banks do all that is humanly possible. I have to hammer at them very hard to persuade them to take high security from their staff.

42,229. *Sir Thomas Middleton*: You mentioned a district in which the illagers complained that they could not get a pinch of salt. You were for time Commissioner of Salt, were you not?—Yes.

42,230. Do your co-operative societies do much in distributing salt?—We ave two or three supply societies which engage in distribution of salt. 'hat movement in the Punjab has now been unsuccessful, but the supply ocieties did during the scarcity which followed the War, distribute a large mount of salt. Primary credit societies still do a certain amount.

42,231. Is the difference in the price of salt between the wholesaler and he retailer very large in the Punjab, notably larger than in the case of he ordinary commodities?—I hesitate to answer so wide a question, but I hink myself that in cases where a village is very far from the railway or rom a metalled road the profit on salt is very great. In those areas which re farthest from the railways and the roads we have found it least difficult o maintain a system of co-operative supply.

42,232. Have you heard of any suggestions for controlling illicit profits on salt?—There was, at the time when I took over as Commissioner of Salt, a scheme before the Government of India for establishing agents in every part of India which is supplied with salt by the Northern India Salt Department, who would sell the salt at a certain price. I worked the scheme on a limited scale and must frankly confess that I have never been in favour of it myself; and I was glad to see that it was abolished just after I left that post.

42,233. That was a war measure?—Yes, it was a post-war measure; but the intention was to make it permanent; and if it did materialise in that way, my own opinion is that it would have led to a great deal of corruption.

42,234. Do you think it would be possible to do anything in the way of establishing supply depots at railway stations where salt could be had wholesale at, say, Rs.2.8 per maund through the Salt Department?—That is more or less what was proposed, I think; it would benefit the retailer and not the ultimate consumer. We found that the agents sold the salt, perhaps, at the lawful rate to the shopkeeper but the shopkeeper did not reduce his price because there was no local competition, or, if there was, it was negligible.

42,235. You have about five farming societies in the Punjab which have met with indifferent success?—Yes, we call them landholding societies.

42,236. What is the nature of those societies?—The land is allotted by Government in one of the new colonies to a society as a group instead of to individuals. The ownership is in the society, of which the members are the tenants; they seem to do a good deal of quarrelling and very little towards improving the cultivation; they seem to be concerned more with how they should acquire the land from the society and keep it for themselves than with really trying to improve the land.

42,237. The idea of continuing this system has been definitely abandoned, I suppose?—Yes, the idea of doing it in a sporadic way. If the Government were willing to give a larger grant of land with a special staff then we could put down model farms and insist on better agriculture.

42,238. You have now got nine mortgage banks in the Province, four on the unlimited liability system and five on the limited liability system. All your newer banks are adopting limited liabilty?—Yes.

42,239. Did the experience of the older banks show that unlimited liability was too risky?—No, it was a difference of opinion, really, between myself as the Deputy Registrar and the Registrar of the time. The first banks were registered on an unlimited basis and worked over a very wide area; I formed the opinion that we should work with a smaller area and that we

should connect up more closely with the primary credit societies and that there should be limited liability because it was not sound, theoretically, to pledge a man's unlimited liability in two places. The majority of the members of the mortgage bank were already members of unlimited credit societies.

42,240. Is there much land mortgage redemption done by the societies outside the mortgage banks?—Small plots are redeemed; they simply lend to a man, say, Rs.50 or Rs.100 and he redeems his land.

42,241. That loan is for a short period?—Yes, two or three years.

42,242. There is no long period, say fifteen or twenty years, for which primary societies lend against a mortgage?—No.

42,243. For how long a period do the mortgage banks lend?—Generally for five years at first, and now for ten.

42,244. Is there a large area of land in the Punjab which is irredeemable, that is to say, where the mortgage is much in excess of the actual value?—Yes, especially in the districts which are most crowded.

42,245. You refer on page 290 of your note to the difficulty which you have experienced owing to the fact that your dairy students are not accepted at Bangalore. With all the developments that are taking place at Lyallpur, would it not be possible to provide a dairy school sufficient for the needs of your men in the Punjab?—Not, in my opinion, for graduates; they already help us very much with our undergraduate sub-inspectors. But Bangalore has a number of teachers, whereas Lyallpur, I think, has only one man trained for this work. Then again Bangalore has cattle of every kind, whereas Lyallpur has only one or two kinds of cattle. Bangalore has every kind of machinery, but Lyallpur very little.

42,246. All your men who went to Bangalore were post-graduates?—The eight men who went were graduates.

42,247. So that this is a post-graduate course?—Yes.

42,248. And yet the Government say that this is an elementary course?—Yes. I do not mean to suggest that the class only admits graduates. As a matter of fact, I was told that my men were the only men worth having.

42,249. On page 292 you refer to speculation by the cultivator in holding his own produce. Is not such speculation legitimate?—Certainly it is, up to a reasonable point. I only mentioned it as a cause of indebtedness.

42,250. I was not clear whether you regarded it as a legitimate course or otherwise?—Often quite legitimate, but it is doubtful whether it is always a profitable course.

42,251. On page 296 you propose a remission of land revenue for afforested land. Would your commitments be serious in that case in the Punjab?—If it were spread over the Province the commitments would probably be very large; but you would gain enormously in the outturn of agriculture.

42,252. I take it that your intention is to popularise the process of afforestation and therefore you would limit your commitments; you would make it experimental, in fact?—Yes; but I would like to carry the experiment a long way; and I believe even if it were introduced permanently it would nevertheless be profitable both to the Government and to the zamindar.

42,253. You would carry the experiment far enough to popularise your method?—I would do that at least.

42,254. What are these rural community councils which you have in the Punjab?—They are bodies which contain a number of non-officials and in most districts one local official of each of the departments concerned

with development, that is Education, Agriculture, Veterinary, Co-operation, &c.

42,255. Are they numerous?—There is one, I think, in every district, but they do not all work.

42,256. How many work?—I have not the detailed knowledge to say how many, but I must explain that they are comparatively new.

42,257. How are they financed?—That is the greatest difficulty. The Rural Community Board in Lahore has been financed by a considerable grant from Government, which it distributes to the Councils. Apart from that the community councils are provided with lanterns sometimes by the Education Department and sometimes by Health, &c.; while the District Boards also help with money in some cases.

42,258. Can you give any indication of the extent to which State finance or funds from other sources are available?—They are very largely State financed at present; they are quite new.

42,259. You are probably aware that parallel bodies in England are financed partly from the Carnegie Fund, partly from the Development Fund and partly from local funds?—Yes. I examined that when at home.

42,260. You attach great importance to schemes of enclosure, both for protection from wild animals and for conservation of pastures. Is any enclosure going on in the Punjab?—No. I intended that to apply particularly to Ajmer, where there are hills running right through a narrow tract of British territory. The damage is particularly bad there because the neighbouring States do not allow pigs to be killed. It is chiefly a question of pigs.

42,261. In that case you require wire fencing?—I think dead thorn fences would serve.

42,262. You have also suggested enclosure in connection with the improvement of co-operative pastures?—Yes.

42,263. That is for the Punjab?—Yes.

42,264. There you would presumably use live fences?—It would vary from district to district, because some plants suitable for fencing will not grow in some parts of the Province.

42,265. On page 294 you point out the difficulty of repairing improved agricultural implements. Is that because of the fact that so many of them contain cast iron parts?—And also the lack of training of the local smith.

42,266. You refer to the work of the Rural Community Council in Kent. The feature there was that the Instruction van was fitted up with an acetylene welding plant. The local smiths were good workers, but they had not the necessary appliances?—I have read a report of the National Council of Social Service, which said it was also necessary to instruct them.

42,267. Do you think there is any chance of introducing acetylene welding plants in the Punjab?—It might be possible, but I think it would probably be wiser, in view of the quality of the present smiths, to train them in fitting on cast iron parts and in small repairs, and have smiths at selected places specially taught the rest of the work.

42,268. The process is an easy one; the provision of the appliance is really all that is necessary?—In that case I should certainly like to see it.

42,269. *Mr. Barron*: I want to correct an impression given in paragraph 1 of your answer to question 2. You seem to think that this scheme for the technical training of Lyallpur graduates has been approved?—Yes.

42,270. It has not been approved. It is still being considered. Had you anything to do with preparing that scheme?—Yes. I was consulted with regard to the financing of it and as to whether we could found a co-

operative society which would finance the students and gradually recover the money, with the assistance of the Director of Agriculture, from their crops. I said I thought we could, but I doubted whether any existing co-operative organisation could risk its money in the matter and that I thought that Government should finance it.

42,271. Did you work out the financial aspect of the scheme as far as the student was concerned, as to the amount of subsidy which would be given him while he was working this farm?—I did not know they were going to give any subsidy.

42,272. When the scheme was examined it was found that it did amount to giving a very considerable subsidy, and the doubt was whether he would learn anything while obtaining this subsidy which would enable him to earn his own living afterwards?—Was there a subsidy even if the scheme was co-operatively financed?

42,273-4. Yes. I forget the exact amount, but it was a considerable sum. I do not understand why the men who applied to you for inspectorships from Lyallpur turned out to be so largely urban. Lyallpur admits students in the proportion of one fifth non-agriculturist and four fifths agriculturist. Was it only the non-agriculturists who applied to you?—In the last year that was practically the case. I receive the list through the Principal of the College. I have not had one this year, although I have written for it. Last year I was able to take one excellent agriculturist, and I rejected one, because he had been looking for employment for two years and was obviously not a man of high grade. The rest were non-agriculturists.

42,275. Do you mean that the College urbanises the agriculturists?—No. They were all of non-agriculturist castes.

42,276. *Sir James MacKenna*: With reference to what we may call applied co-operation, that is to say societies for the purpose of sale, and so on, at what stage of development did you begin introducing these in the Punjab? Was it after you had laid the foundation of your primary credit societies fairly solidly?—In 1915, after co-operation had been working for ten years, there were virtually no such societies. For two or three years during the War we were engaged in consolidating our position and it was only when the war strain became severe and the post-war scarcity set in that the supply system was tried. Co-operative sale societies were not due to war scarcity, but arose because we had reached that stage of maturity.

42,277. They are established in areas where credit societies are pretty sound?—Yes, as a rule, but I do not know that we have ever tried in other places.

42,278. Are members of these societies members of credit societies also?—A good number of them are not, because in sale societies you have a large number of men who are too wealthy to need credit and in supply societies you may have people who are too poor to obtain it.

42,279. As a rule, these societies do best in areas which are pretty well saturated with co-operative ideas through the work of the credit societies?—They have done well in those areas, but we have not tried them anywhere else, and they do not necessarily do best in those areas where we have most co-operative credit. They have done well in the markets of exporting areas, but co-operative credit began in the non-exporting areas occupied by small-holders.

42,280. It is really a supplementary development on broader lines and possibly covering a wider area?—In those areas where people produce a surplus beyond their own needs.

42,281. I notice in the Punjab the Provincial Bank came very late; in fact it is one of the latest developments. Am I correct in assuming that the system here has been to establish primary credit societies in the first

place, and then to develop Central Banks tapping the local capital in the district, and that you did not feel the necessity for an apex or provincial bank until the bigger question of inter-provincial transactions arose?—That was not the main reason for the Provincial Bank. The main reason was that for some years the Registrar had carried on the business of inter-lending between the Central Banks in the Punjab and that business became so big that some body was required to deal with it. Inter-provincial business was small and still is small.

42,282. It is also filling a further gap in the movement, in that you are now able to render service to neighbouring Provinces?—So far we have chiefly obtained service from neighbouring Provinces.

42,283. It seems to be a nucleus of the All-India Clearing Bank suggested by the Maclagan Committee?—Either that or a clearing house. I do not know whether you could carry the overhead charges of a bank at present, but that was suggested by the last Conference in Bombay.

42,284. *Professor Gangulee*: I should like to have a clear idea of the various rural organisations in this Province. You told us you have rural community councils, and I think you have also a Rural Community Board. Could you tell us what the functions of the Rural Community Board are?—A Rural Community Board is a semi-official body with a Minister as its President and a certain number of non-official members from such bodies as the Red Cross. At present, it is predominantly official, and I imagine the central body will for some time to come be predominantly official. The rural bodies are, I think, predominantly non-official. The rural board obtains a large grant from Government and considers the financing of such objects as village libraries, which it has done on a considerable scale, the printing of charts on natural history, and so on, to be hung in schools, and the supply of literature from various departments and from private persons, to be read in adult schools and placed in middle school libraries. In addition it has given a subsidy for drama and a subsidy for the preparation of a co-operative film.

42,285. It acts chiefly in an advisory capacity?—The distribution of funds and literature is its chief function.

42,286. At whose suggestion does it make this distribution?—At the suggestion of the various members of the board. I as a member of it put before the board any co-operative pamphlets I should like to have placed in the middle school libraries. I also assist Mr. Brayne's applications from time to time, because I have an opportunity of visiting his district very often. Drama, for instance, has been subsidised in that district.

42,287. What is the relation of these councils and this board to the District Boards?—The board has no relation with the district boards, but the rural community councils often have some relation with the district boards. The Rural Community Board is a provincial body.

42,288. So the Rural Community Council has much to do with the District Board?—I do not know. I think that varies from district to district. The secretary is usually the local district inspector of Schools, who is a servant of the District Board, and I think the councils co-operate with the boards in such matters as the use of lanterns and so on.

42,289. What place have the village *panchayats* in that scheme?—Not many of them are vital bodies in the Punjab. I wish they were.

42,290. They are beginning to be so, I understand?—Many have been created, but I do not think many are functioning.

42,291. *Mr Kamat*: These Rural Community Councils practically take the place of your village *panchayats*?—No. They are distinct bodies.

42,292. *Professor Gangulee*: You classify all societies into four groups, "A," "B," "C" and "D." What is the basis of that classification?—I think I have given that in my memorandum. "A" class societies receive no help at all but audit, although it is open to the inspector to inspect and exhort them at any time. The "B" class society does its own writing work and granting of loans and recovery of debts and pursuit of defaulters. "C" class societies want help in all these matters.

42,293. Four per cent. of your societies belong to the "A" class?—Out of those classified.

42,294. Four per cent. of the total number classified?—Yes. It is about one-half the total.

42,295. With regard to cattle-breeding societies we have been told that cattle-breeding does not pay, but I find from your report that cattle-breeding societies have increased in number from 43 to 123 this year?—They now number 150.

42,296. So there is a growing demand for co-operative cattle-breeding societies?—I think so.

42,297. Are they paying?—You cannot consider cattle-breeding as a separate activity. It is all part of the agricultural economy. I do not think you can separate cattle-breeding from the rest of a man's work. It is thus impossible to say whether it is paying or not, because it cannot be separated from the other operations of farming. If a man had no bullocks, he could not carry on agriculture.

42,298. As a breeding proposition as distinct from the needs of agriculture, are they paying?—I do not think any of them has attempted to undertake breeding as a business, though one or two may have. They breed for themselves and sell their surplus young stock. When we reach further developments in the Rawalpindi Division, I understand that they will breed to sell.

42,299. *Mr. Calvert*: They aim at organising the supply of the existing demand on a better basis?—Yes.

42,300. *Professor Gangulee*: How do they solve the difficulty of fodder?—I am afraid they do not. We have tried storage in overhead mounds, but we have not succeeded in inducing them to accept that. Underground pits have been successfully experimented with in Attock and enclosed pastures are allotted to societies there.

42,301. Has anything been done in regard to silage?—In Attock 150 pits have been successfully dug.

42,302. Are all these pits managed and owned by the societies?—No. They have not been co-operative hitherto. They have been due to the activity of a progressive Deputy Commissioner, who has used his staff to persuade the people to take to them. In that work he has had the assistance of the co-operative staff.

42,303. Do these societies practise a system of milk recording?—We have 33 separate milk recording societies.

42,304. Separate from the breeding societies?—Where there is a breeding society in the same village, members of one are usually the members of the other.

42,305. Have any of these societies started a herd book?—Every society has one, though not in a pompous form. The fact that a register of cattle is kept means that they have a herd book.

42,306. What are the special difficulties these societies have in the way of developing cattle breeding? You have already mentioned the fodder question. Is there any other special difficulty?—To my mind the chief

difficulty is the supply of bulls. There are not sufficient bulls. I may say there is a fair supply of Hariana bulls from the farms, I think about 300 per annum, but we could absorb a considerably larger number than that. The whole difficulty is that there is no properly organised system for the supply of Dhani bulls in the North-West of the Punjab, and unless that is done you cannot ensure a regular supply.

42,307. Is there anyone to give them advice in technical matters?—We have two inspectors who have been taken from the Veterinary Department, and in addition to that, where these inspectors cannot cover the ground, we use the local veterinary assistants from whom we receive excellent help.

42,308. Do you think any further assistance in the form of special facilities from Government would help these societies? Can you suggest any special direction for further guidance from the State?—The only facility required is more bulls. I do not think it is probable that local bodies can be induced to accept it (I wish they could), but when travelling in Scandinavia I found it was quite an ordinary thing for local bodies to give a bull to a co-operative institution and allow them to reserve it for their own members. I cannot persuade the District Boards to do that; they say they are supplied by public money and everybody must be allowed to use or misuse them.

42,309. You have already expressed your views on the question of *taccavi*. Do you think that co-operative societies can be largely employed in connection with the grant of *taccavi*?—I do not think it is necessary. If the co-operative society can give the loan there is no need for taccavi. I should like to correct one thing I said this morning. The Chairman asked me if the *taccavi* system would ever compete with the co-operative system. If you had *taccavi* being given to members of co-operative societies, I think it would be extremely inconvenient, because it would impair the credit that they have with their society. I do not think it often happens.

42,310. With regard to moneylenders in the Punjab, I think you have now passed a new Act called the Regulation of Accounts Act?—No, it was passed but disallowed.

42,311. Do you think such an Act would have solved the problem of controlling moneylenders?—Yes, if it did not funk the difficulties. That Act did try to get right down to the root of the difficulty and deal with it. I am afraid of Acts such as the Usurious Loans Act being passed, because they only go half-way and will hamper really effective legislation.

42,312. You have mentioned the question of commission shops. Are they in touch with the exporter?—They sell for the most part to agents of exporters and internal traders in the market towns.

42,313. Have they any storage facilities?—In most cases not on a large scale. They all have a little, but as a rule the cultivator does not want his goods held up very long. The commission shop usually rents temporarily a local store if he does.

42,314. What measures and weights do they use?—They use for the most part the ordinary cross-beam balance with the double scale. I wish I could induce them to adopt something better. As regards their ordinary iron weights, wherever a Municipality stamps the weights, they use the stamped weights; otherwise, all I can guarantee is that they do not fake their weights where they are not stamped.

42,315. Do you hope to see these societies organised on the lines of the National Farmers' Union in England?—I hope to see the National Farmers' Union organise societies on our lines.

42,316. Turning to your note on better farming societies what salaries do these *mukaddams* draw?—They are servants of the Agricultural Department, and they draw about Rs.20 to Rs.50 per mensem.

42,317. Are you satisfied with their training?—We have not yet had experience of them; they have only just come to us.

42,318. I see that you have mentioned the difficulty of sending money from the villages by means of money orders. Do you think the postal order system in vogue in England would be a good one to adopt?—I do not think that would help. You could not introduce postal orders in places where you cannot introduce our money order system. I have been in consultation with the Postal Department about it, and I should like facilities, but they say that they cannot obtain in the villages men of sufficient integrity and ability in large numbers.

42,319. You do not make any reference here to the work of seed distribution. Are co-operative societies taking part in this work?—They are. But in this Province I do not think it is necessary at present on a very large scale, because the agents of the Agricultural Department are so widely distributed and seed is bought from them. The better-farming societies now being created will undoubtedly take up this work.

42,320. Are women taking part in the co-operative movement in this Province?—They are in the thrift societies to some exent and in the credit societies. Most of those in the credit societies are widows, but we have two women who are presidents of credit societies.

42,321. You say that co-operation cannot win the final victory without women?—That is so. One will find that a thing proposed to a village may seem to be accepted to-day, but to-morrow it is not. We have an inspectress.

42,322. In discussing the question of education, you refer to the Folk high schools in Scandinavia; is there any scope for developing such schools in India?—I should like to see some kind of adult education which will educate the man who has gone back to the land and which will broaden his ideas.

42,323. In a co-operative adult school, do you get much assistance from the District Board?—None so long as the school remains co-operative. We transfer them to the District Boards as soon as we are satisfied that they are working well. We start the school and work it for six or eight months, and then hand it over to the District Board.

42,324. I am interested in your co-operative system of compulsory education. How is that working?—They are working on the whole extremely well. The members pledge themselves to educate their children up to the end of the fourth class.

42,325. If the members do not care to do so, do you impose any fine?—The societies fine them.

42,326. Turning to your banks, what is the relation of your Provincial Bank with the Imperial Bank?—It has an overdraft account with the Imperial Bank against Government securities deposited. It has now obtained permission for a cash credit against the deposit of pronotes of the Central Banks.

42,327. The Imperial Bank recognises your pronotes?—I have just arranged it.

42,328. What is the maximum rate of dividend admissible on shares in your Central Banks?—The Government notification limits it to 10 per cent.

42,329. That is the maximum?—Yes.

42,330. Do you have variation from year to year?—Yes, frequently.

42,331. What is the security on which your Banks advance loans to the primary societies?—Their excellent behaviour and nothing else.

42,332. When you sanction a loan to a primary society, do you scrutinise the object for which the loan is being taken?—The Central Bank has sometimes tried to scrutinise the object, but we discourage it very strongly, because if the Central Bank tries to interfere in the loan-giving of the primary society, that weakens the primary society which is the basis of our system. The primary society does it all.

42,333. There is no concern as to how they would utilise the loan?—No immediate concern. If the loans were misapplied that society would be unable to repay; it would be put on a lower grade, and its borrowing limit would be reduced.

42,334. What is the longest period for which a loan is sanctioned?—Nearly all banks now give loans on demand, but the understanding is that they are intended to be repaid in four or five years.

42,335. The term of repayment is fixed?—No; it is on demand.

42,336. What is the existing arrangement made by the Central Bank for the disposal of the loan application? When a loan application comes in, how long does it take to sanction the loan?—In the best banks it takes about five minutes and in the worst banks it may take up to a week.

42,337. I understand in this Province Government does not undertake the work of supervision?—It sometimes does, but for the most part not.

42,338. Your supervisory functions are relegated to the Union?—The Punjab Co-operative Union; and the banking unions already do a great deal.

42,339. You have inspectors appointed by the Provincial Union?—The Provincial Union only appoints the sub-inspectors to audit accounts; the actual appointment of the individual is done by the local Assistant Registrar; the Union sanctions the posts. The creation of a new post comes before the Union.

42,340. The Union is a non-official body?—Yes, with the exception of the Registrar, who is the President; and every Assistant Registrar is an ordinary member of the general meeting but not of the committee.

42,341. With regard to the management of the banks, the Board of Management that you have are elected from the village societies?—They are elected partly from the individual shareholders and partly from the representatives of the village societies.

42,342. *Mr. Calvert*: You have been on deputation to Europe, I believe?—Yes, twice; once for four months and again for two months.

42,343. Would you say that your deputation was of great value in your public capacity?—Of great value.

42,344. How does the increase of value in your public capacity compare with the actual cost incurred by the Government?—I do not know what it cost the Government; but personally I could not have carried out the duties nearly so well if I had not been deputed.

42,345. You think that other Provinces might benefit by deputing some of their staff to Europe?—It is almost essential, particularly with Indian Registrars who have been brought up in this country. The same thing applies to the Indian staff in this Province. We are sending one man next year.

42,346. I understand you have been both to Ghakkar and Moga. Could you give a brief account of this new type of training?—I am not an educational expert. I like very much what I saw at both places as regards the "project" system of training. I went into some of the classes at Moga where I found that small boys of seven or eight had taken an active part in the selection of the project. They were able to tell me all about it

without the help of masters. I am talking of the small boys in the middle school which the Moga Normal classes teach. In Ghakkar I have seen the Normal school but not the classes being taught. There I like the outdoor, healthy system. I think that if you could take all your village schoolmasters and your secondary schoolmasters and train them on methods like this they would be wider minded citizens and very much healthier men. I have not seen Gurgaon.

42,347. You think the Ghakkar training will give the rural bias to the teacher?—Yes, much more than the Moga. I would add that the Gurgaon school is now being taken over by the Department of Education.

42,348. I think you gave us some indication of the extent to which you work in touch with other departments, Veterinary, Public Health, Education and Agriculture?—Yes; I am also in touch with various other Departments, for instance the Police. I am carrying out a scheme with the Police for the tattooing of cattle both for the prevention of theft and for the registration of cattle breeding societies.

42,349. With regard to co-ordination with the Education Department, could you give us some indication of the line it takes?—We are coming into fairly close touch through the Rural Community Councils. They inspect our adult schools and they seem to welcome very gladly our compulsory education societies.

42,350. Does your staff lecture at all?—We lecture in all kinds of schools except primary schools, that is, in the middle schools, high schools and Normal schools and in the Training College. We have also thrift societies for the masters in the secondary schools who are willing to have them and also school supply societies for stationery and so on in a great number of schools.

42,351. Do you yourself give lectures at all in the Central Training College?—I have from time to time; but it is becoming increasingly difficult.

42,352. Did the Provincial Bank succeed in floating any debentures?—Yes, 5 lakhs of debentures which were over-subscribed.

42,353. Was the interest guaranteed by Government?—At 6 per cent. for 25 years on 20 lakhs of debentures.

42,354. Is that sufficiently promising? Could you float more?—There is a difference between our Trust Deed and that of the Bombay Central Bank and I am approaching the Government to see whether the defect in our Trust Deed can be removed and if that is done there will be no difficulty in floating on a large scale.

42,355. I think you are trying to introduce the cinema on the side of your propaganda?—We have almost completed two films, one on co-operative credit describing the rise and fall of a *bania* and the fall and rise of a zamindar in a certain village, and another with very little story showing the various forms of cattle breeding and so on.

42,356. Shall we be lucky enough to see them?—I hope to show them to you at Lyallpur with the help of the Agricultural College.

42,357. On this question of agricultural indebtedness, do you think the fact that the cultivator draws his income twice a year at six months' intervals makes it necessary for him to borrow?—His variable income makes it necessary to borrow, but the line I take when talking to cultivators is that he does not receive it only twice a year. There is no month in the year when the cultivator in most areas does not receive some income; the bulk of his income however comes in two seasons. It takes a long time for the crop to mature and he has to live during that time.

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42,358. With regard to your answer on irrigation, do you think if an officer of the status of a Superintending Engineer were appointed to work out the schemes for land improvement it would do much good in this Province?—I think it might.

42,359. At present the initiative for land improvement comes from the cultivator?—Yes, except in so far as it comes from the co-operative staff who ask the cultivator to do it. Only in the Gurgaon district is there a special Engineer for embankments; also there is a recent proposal to take up on a large scale the question of erosion in Hoshiarpur and Ambala and place a special co-operative staff on it to help in organisation. I should like to see that idea extended to other districts.

42,360. You say that cow dung is used less freely as fuel in hilly districts. Does that apply to Kangra?—Yes, I think so, and it certainly applies to the Murree hills where I think you would habitually see a wood fire burning. Yes, it does apply to Kangra too, for I have just had a suggestion from the Forest Department that we should take up a forest contract and cut and sell the wood co-operatively for fuel.

42,361. Do you propose that the cultivation of fodder should be stimulated by remission of land revenue?—Yes.

42,362. Would not that rather suggest that land revenue is in some way responsible for the lack of pasture?—No, it is not the land revenue of that particular land that I want to remit; I only recommend remission as a means of giving a bounty in such a way that it will really reach the people without deductions. The remission should be of revenue on their other land.

42,363. You do not think that the plan will do any harm?—No.

42,364. Do you mean that it will be exposed to criticism on that ground?—No, it will not if the position is clearly explained to the critic.

42,365. May I ask who would get the remission?—The persons who enclose the land. For instance, there might be two means; a group of members might agree to enclose a tract of their own land; or they might take up their proportionate share of the *shamilat* (common land) and enclose that.

42,366. How would you select the persons who would get the remission?—The members of the society would. Tentatively I have suggested that for every acre enclosed they should receive a remission of one and a half cultivated acres.

42,367. A person holding one and a half acres need not have any connection with the land enclosed?—Yes, he will, because it will only be remitted in the case of persons who join in the enclosure.

42,368. How would you get over the difficulty of persons who have not 1½ acres of cultivated land. Would they too receive a remission to the extent of one and a half times the land enclosed?—Such persons could not have contributed their land to be enclosed, and if the enclosure was in the *shamilat* they as non-landowners would not have possessed a share in it, so they could receive no remission.

42,369. This seems to me to be a very complicated affair?—I think really that if it were worked out it would be very simple.

42,370. *Mr. Kamat*: Would you insist that the man who encloses his pasture or the man who goes in for afforestation should necessarily be a member of the co-operative society? Would you not give the same facility to others in the village?—I think it would be almost impracticable unless they were very big men. I would fix a minimum area which must be enclosed for pasture, and small individual men who had less than that minimum would not be performing any useful function in enclosing their area, and so I would not give them anything.

42,371. Would it not also simplify matters if you proposed a lump sum arrangement to the effect that a man who encloses, say, one acre should be entitled to so much, say, Rs.5 per acre from the total land revenue demand due from him, instead of having your system of exemption for an acre and a-half or an acre and three-quarters?—That would work out to the same thing really. The revenue per acre is a fixed sum.

42,372. Now coming to your note about co-operation: We find that the co-operative movement has spread so well in this Province and the spirit of co-operation has been imbibed by the people so thoroughly that I wonder why there is this officialisation either in the Provincial Bank or in the Central Banks. Why should the Registrar, I wonder, be the President of the Provincial Bank?—Because it is a large institution which, to begin with, has to be started on sound lines.

42,373. But in every other Province the position adhered to is not this, that the Registrar must be the President of the Provincial Bank?—They can afford to pay for a very expensive manager because they centralise all their funds in the Provincial Banks, whereas we do not.

42,374. In the Central Banks here I suppose the Deputy Commissioners have also a voice in the Board of Directors?—In most of them.

42,375. Here again there is the official element?—I do not see that it does any harm. Deputy Commissioners take very little part in the proceedings.

42,376. In other Provinces there is not a single official on the Board of Directors?—And just *look* at their Banks!

42,377. I do not think that they are inferior to your Banks?—I will not dispute that point; at any rate I did not mean to refer to the prosperous institution known as the Bombay Central Bank.

42,378. Then again, so far as the supervision by sub-inspectors is concerned, although the sub-inspectors are officers appointed by the Co-operative Union, still you say they are under the control of the Government inspectors, so that practically it comes to Government supervision?—No! the whole country is under the control of the police, and yet they are not all policemen; it is quite a different thing.

42,379. Why not take off the Government inspectors entirely?—Because we want to see whether they are working on the right lines or not.

42,380. Do you not think that if the sub-inspectors who are appointed by the Co-operative Union are to work under the Government inspectors, to say the system is not officialised is all an eye-wash?—What other system can you have? What other alternative can you suggest?

42,381. The duty of auditing could be performed by Government auditors and the supervision by the Provincial Bank non-officials?—I am afraid non-officials in this province, although loyal workers, cannot afford to give that amount of time and attention that is required in supervising a large number of villages

43,382. Then why not say frankly that you want supervision through the Government inspectors?—I do want supervision over the sub-inspectors, and I think every province would be very much the better for it if they had this supervision.

42,383. Then why have this system at all?—In order to have non-official control; the Co-operative Union makes recommendations with regard to punishments, dismissals, etc., so that they do take a large share in the control.

42,384. In this province the number of societies is fairly large compared to the total number of villages in the province. I think the total number of villages is 30,000, and you have got 10,000 societies; that is a very good

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proportion indeed. But looking at the membership I find that on an average each primary society is composed of a very small number of men, that is, about 25 to 27, so that the total membership is about 3,60,000, or, I should say, somewhere between three and a-half and four lakhs. Here, again, in other provinces I say by way of contrast, each primary society is composed of a very large number of members compared with the number here?—Yes, and they work over a larger area.

42,385. Is that how you account for it?—Yes.

42,386. Do you approve of the idea of having a very small membership for the primary society?—I should like to see it enlarged; I myself have used my influence to discourage these very small societies; I think myself that many of them are unnecessary.

42,387. Then as regards the rate of interest which your societies charge In such a prosperous province as the Punjab I do not understand why you have not been able to force down the rate of interest below 12½ per cent.?—We could probably reduce the rate to nothing, but the profits on our system all belong to the members, so why should we hasten to reduce it? So long as a reserve fund is being built up I see no harm in maintaining the interest at 12½ per cent. We do not carry off that reserve fund and put it into the Central Bank as is the case in other provinces. It remains in the hands of the primary society, which is the most important society in our scheme.

42,388. *Professor Ganguler*: In your Central Bank you do not have any reserve from the primary societies?—No; sometimes they buy Government securities and place them in the Central Bank for safe custody, but the reserves are not taken into the funds of the Central Banks.

42,389. *Mr. Kamat*: Probably another possible explanation is that as the rate of interest charged by moneylenders in this Province ranges from 15 to 200 per cent., members consider that 12 or 12½ per cent. is a very reasonable rate when compared with the moneylender's rate?—Yes, possibly; 25 to 27 per cent. is the average rate paid by small men.

42,390. *Mr. Kamat*: That, I suppose, is the explanation rather than the principle of carrying the money over to the reserve fund to which you refer?—Yes.

42,391. Then, I suppose, it is considered better to carry the money over to the reserve fund than to reduce the lending rate?—Yes, they are two different ways of securing the same end.

42,392. Referring to your suggestion about the Usurious Loans Act, you suggest that there should be a principle of compelling the Civil Courts to frame issues, and you have described these issues. You say: "Apart from the encouragement of co-operative credit on sound lines, I advocate an amendment of the Usurious Loans Act." You suggest that compulsory issues should be drawn up by the Civil Courts, and one of your suggestions is like this: "Has excessive interest been charged?" Now this issue, you suggest, should be raised by the Courts, although neither party wishes that issue to be raised?—I should have it done even though the parties have not asked for it; the reason for not asking it is often ignorance.

42,393. That opens a question upon which perhaps a similar Act in the Deccan has come to grief. You suggest that the Courts should go behind the whole contract although the two parties coming into Courts do not wish that a particular issue be opened?—I do not admit that they do not wish that issue to be opened; what I say is that one party is too ignorant to ask for it to be opened.

42,394. Suppose the two parties, after negotiations, have agreed to the pay nent of interest at the rate of 12½ per cent. and do not want to reopen

the issue, you want the Court to frame an issue as to whether that rate of interest is a fair rate of interest?—Yes, whether it is excessive.

42,395. And in spite of the two parties not being desirous of opening that point at the time of coming into Court, the Court may decide that the rate of interest should be 6¼ per cent.; do you wish that issue to be raised under these circumstances?—Certainly; in every case I would have that issue raised. The decision of the Court, presumably, is subject to appeal.

42,396. If you give the Court *carte blanche* to open an issue of that sort in *every* case, then the Court may think that 12½ per cent. is an unreasonable rate, that the rate of interest which is reasonable may in one case be 6¼ per cent., in another 8 per cent., and then what happens to parties or to the co-operative societies and all their transactions?—Fortunately the co-operative societies do not have to sue, so that they will not come into Court under the Usurious Loans Act; but with regard to the other parties I think you can very soon correct your Courts if they give absurd decisions. There are loans with regard to which 12½ per cent. interest would be altogether excessive. I leave it entirely to the Court to decide.

42,397. I wonder whether in any system of jurisprudence there is an enactment compelling the Court to raise an issue which the parties did not desire to be raised?—I do not know, and I do not admit that the parties do not want to raise it. What I say is that the parties have not raised it, and I have quoted one case in the Punjab legislation, namely, the Pre-emption Act, in which such issues are raised compulsorily by law.

42,398. You have been telling us about the compulsory consolidation of holdings; I see you have a fairly large staff to carry on consolidation on co-operative principles; I think you have got something like 70 inspectors?—We have 70 sub-inspectors and six inspectors.

42,399. As the result of the appointment of this staff of 70 sub-inspectors, how much consolidation work has been done during the last four or five years; I mean the total area consolidated?—I will look that up in my notes here.

42,400. No, I only mean, is it fairly considerable?—It is 60,000 acres in 250 villages, but that was not done by 70 sub-inspectors. I think you have received some copies of a note which I sent to the "Agricultural Journal of India" in which I have pointed out the gradual increase of the staff; we have only just come up to 70 from last April; the year before that we had 50, and the year before that, I think, we had 30; so that our average has been about 30 sub-inspectors.

42,401. This consolidation by 70 sub-inspectors has been the result of how many years' work?—I think five years, with a very, very uncertain stage at the beginning with practically no staff.

42,402. Leaving out of consideration the first two years and taking the last three years only, you say 60,000 acres in three years have been consolidated, which amounts to about 20,000 acres per annum consolidated by a staff of 70 sub-inspectors?—In registered societies. There is another area of 20,000 acres or so which has been done, but since the villages have not yet been completed we have not registered the societies.

42,403. I want to see whether that can be considered an adequate return both for the expenditure of time and the staff at your disposal, if about 20,000 acres per annum can be done by this process?—I think so; I think the gain to the people is worth it. In that article which I sent to the "Agricultural Journal" I have shown how Government recoups the whole cost in a very short time. Perhaps you remember the two instances in that article where Government not only recoups the whole cost after about three years, but continues to recoup it every year after that for ever.

42,404. In the light of your valuable experience in this Province on this question of consolidation on co-operative principles, I should like to ask you your opinion of the proposed Bombay Bill on this subject; have you read it?—I have seen a draft of it, privately.

42,405. That Draft Bill is based on the idea that there should be fixed for each tract of the Province an economic holding below which partition should not be allowed, but that if the cultivators want a partition of their land above that limit there should be no objection. Do you approve of that principle?—No, it seems to me to be unsound, particularly in a tropical country where factory conditions are so very difficult to regulate. I should be sorry to see a separate industrial class grow up in the towns; although I admit it reacts on industrial efficiency, I myself prefer to see the system which prevails round Bombay, and which I have also seen in Belgium, where the ordinary peasant's family have not enough land to live without industrial work; in Belgium, for instance, they send one man to go and work in the factories, while the others remain at home.

42,406. I think you are under some misapprehension, because it may apply to districts 200 miles away from Bombay?—Yes, and there it seems to me to be quite unnecessary; I would leave each man to cultivate his holding much more extensively and go and work in the towns and come back again.

42,407. You said the Bill for the regulation of the accounts of the money-lender was disallowed by Government; was that because they thought the Bill was faulty in drafting, or was it because they did not approve of the principle?—I do not know. I do not think it can be altogether because they disapproved of the principle, because in the same speech in which His Excellency announced his disallowance, he said the Government would bring forward another Bill on the same subject.

42,408. So that the principle of regulating accounts is acceptable to Government here in the light of their experience?—It would appear so.

42,409. You refer to an Inspectress in your department; what are her functions, especially with reference to persuading women to join the movement?—For the most part she has been engaged in assisting thrift societies and also in setting up a few classes for adult education of women; she has also been considering, though she has not begun any work in that direction, the formation of subsidiary industries. We have now a few sub-inspectresses under her.

42,410. You say that in this Province the adult schools have been a success; in another province I know they have not been a success. I should like to know on what lines you make them a success; are they night schools or day schools?—The majority are night schools but they are not necessarily night schools.

42,411. The adults come to the schools after the day's labour?—Yes.

42,412. They are not too tired to attend to the lessons, or the readings or whatever it is?—No. I am not an educational expert, but I have formed my impression from talking to my own staff and to zamindars and cultivators.

42,413. What is the distinguishing feature that has made them a success here?—I do not know why the other provinces have failed; here it seems to me, after persuasion largely by a rural staff both co-operative and educational, there is a feeling amongst the cultivators that they can escape from some of their economic difficulties and also have a more interesting life if they know how to read. In our co-operative schools we simply find that they are amused and interested by reading.

42,414. I should like to ask you whether you are in favour of something like an Insolvency Act; you say in one place that in certain cases of

indebtedness, the cultivators have reached a point when the moral fibre of the men is practically destroyed, and they are beyond hope so far as even the co-operative movement is concerned. In such a case, where a man is hopelessly involved with a debt which has been hanging over him for years, would you be in favour of enabling him to have recourse to insolvency?—No, I think not. I would adopt special measures, because in such an area if you adopted ordinary insolvency on a large scale you would demoralise people, and also the Courts could not cope with the work. I do not think it should be referred to the ordinary Courts; I think a Court much more free from the restrictions of the Insolvency Act is required. I would have special Courts or *panchayats*, but the *panchayats* must have definite powers to assess what the man can pay and fix instalments. Then I think you would have to cause him to mortgage his land to an institution which would keep him alive during that time. I think it would also be necessary to make it compulsory that he should sell his grain through a co-operative or semi-official organisation until he had paid off the debt.

42,415. If you introduce the principle of forcing him to go into insolvency, is not there the fear that you may demoralise the whole countryside?—Yes, I should be very much afraid of it. I do not want him to be insolvent; I want to have a settlement of debts, which is not the same thing.

42,416. *Mr. Roberts*: I presume that the part of the five-years' development programme which refers to co-operation between the Co-operative Department and the Agricultural Department is approved by you?—You refer to the *mukaddams* and the better farming societies.

42,417. Yes.—Yes, I think it is most valuable.

42,418. Does that meet all you wish to do?—As regards that particular thing, the better farming societies, Government has drawn up a moderate scale of increase, and I do not think we can ask it to give us more *mukaddams* until we have first seen how the societies work; it seems to me in that particular line to be quite sufficient. I have made a suggestion to the Director of Agriculture, which I expect he is considering, that Government should help milk recording societies by small grants to all those who wean their calves. Our great difficulty in regard to milk recording is that we cannot get the calf kept away from the cow and so you cannot tell whether what you are recording is the real output of the cow.

42,419. That is more or less a question of Government policy rather than of ways in which the Agricultural Department could directly help you. There is no other line which you can suggest at present as to how you think the two departments might combine more?—I do not think so; I want to see a large expansion of the Agricultural Department, with cattle farms at every district headquarters which the people could be brought to see.

42,420. Do you experience any difficulty in persuading people to agree to consolidation of holdings? Is there any difficulty owing to your not being able to get all the people to agree?—That is the difficulty; the bulk of the people usually agree, but then there are a few cantankerous people and absentees.

42,421. Would you be in favour of some form of legislation compelling a small minority to come in?—Compelling a small minority who are present?

42,422. Yes.—Yes, in advanced areas. As I mentioned in answer to the Chairman, I also want legislation for securing the society against subsequent attack by reversioners, it might be of a widow, and similar cases.

42,423. What proportion of the villagers would have to agree before you would think it ripe for consolidation?—I am not prepared to deal with

details like that; under the Continental custom it is usually those owning about two-thirds of the land who can compel the others; but I think we might be more cautious here and be content with three-fourths or four-fifths.

42,424. Then there is the question of the payment of land revenue into Central Banks; is it possible now to pay land revenue through any bank?—I believe at present the Imperial Bank, which wherever it exists is the treasury, or receives the money of Government, receives cheques on a bank which is on the local clearing house, but our co-operative banks are not on the local clearing house; they are not large enough. I should like the Imperial Bank to accept our cheques both in places where an Imperial Bank branch exists and also in special cases where no branch exists but where the Registrar certifies a co-operative bank to be efficient; I desire that with regard to any banks that are in outlying places where there are no Imperial Banks; that would help very greatly in getting revenue paid in.

42,425. Is the Provincial Bank in a sense behind the Central Banks?—It accepts no responsibility. In the Provincial Bank we hold committee meetings once a month and I am in frequent consultation with the Directors. I have endeavoured to build up and hold an invested fund that would meet an emergency anywhere in the province. We are not yet large enough to do that, but when we are large enough we hope to be able to stand behind all the Central Banks.

42,426. Supposing we have a few years of agricultural depression and borrowing tends to increase, there may be a run on these banks; do you think the strength of the Provincial Bank is sufficiently great to stand it?—Not the Provincial Bank alone; what we actually have at the present moment is 81 lakhs of Government securities in all the Central Banks; that gives a very fair margin to meet a run.

42,427. Have you any fixed idea as to what percentage you ought to have to meet a run? You talk of a total deposit of 10 crores?—No, you cannot compare the figures of co-operative banks, which deal largely with a rural population and agricultural credits, with the figures of joint stock banks which give short-term loans; we are in a much safer position so that there is no analogy to be drawn between us and joint stock banks.

42,428. You think it is in a safer position, do you?—Very much, because our deposits are all held for a year or so while the joint stock banks may have their money withdrawn immediately; we are not exposed to that difficulty.

42,429. Do you take a fair amount of short time deposits?—No, we seldom take deposits for shorter periods than six months and the bulk of the deposits are held for a year.

42,430. Would a guarantee by Government of a substantial sum help the stability of the bank? Would you welcome that?—No; I should be sorry to see a guarantee by Government; it would create misapprehension. I have only yesterday written to a certain Deputy Commissioner who put an advertisement in the paper, saying I thought it was unfair that he should say that his bank was controlled by the Punjab Co-operative Department.

42,431. *Sir Thomas Middleton*: To what extent have your co-operative credit societies succeeded in reducing by competition the rates of interest charged by the ordinary moneylender?—I do not think very much, because the ordinary villager either attaches himself to the moneylender who charges as before or he goes to the society, whereupon the moneylender refuses to lend to him any longer. I have often heard of cases where villagers have said the rate has fallen, but I do not think the fall lasts, and I do not deplore that, because the people who go to the moneylenders

are the thriftless ones, who will not join a society. They probably expose the lender to greater risk, so that it is fair that his rate should remain high.

42,432. You are inclined to think the rates charged are no greater than are required by the risk taken?—Certainly the apparent rate is not, if it were not combined with other methods which increase the moneylender's profit. I now wish to make a correction. I said this morning that primary societies did very little with regard to redemption of land. I see on looking at the last two annual reports that I was wrong there. About five lakhs annually are spent on the redemption of land through primary societies. We also get the same figures by analysing after ten years the conditions of the members in the primary societies.

(The witness withdrew.)

Sardar HARDIT SINGH, of Messrs. Hardit Singh & Sons, Fruit Farmers and Nurserymen, Mona R.D., Punjab.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(c) Yes. The most important subjects for research not investigated so far except by myself, and to which attention might usefully be turned, are: (1) The problems of the five-acre or the under-five-acre man, and (2) Horticulture.

As to No. 1, I have already submitted my thesis on "My Farm Home of Peace and Plenty, or Rs.5,000 from 5 Acres" to the Commission. This is the result of practical work, extending over many years of my life.

As to No. 2, I have put in 22 years of my life in investigating the problems of horticulture. After spending some time in America in 1904 and 1905, I took to the business of horticulture, growing fruit, flowers and vegetables of the first quality in great abundance. I have now a fruit garden of 45 acres, which is being run more or less on European lines. In the plains of the Punjab, fruit of great excellence has been produced. Out of the 18 varieties of American Jap plums experimented upon, eight have proved successful and their fruit has met with the approval of even the present Governor and the Governor-General. Having such practical experience extending from 1904 to 1927, I thought I might usefully turn my attention to writing some literature on the subject, but, to my misfortune and the misfortune of the people, the Department of Agriculture has turned out to be unsympathetic. The first book on cotton and the second on melons are still in their first editions. The other books that I have written but are still unprinted are:—

1. *Kasht-i-Phal* or a book on fruit growing.
2. *Kasht-i-Sabzi tarkari* or a book on vegetable growing.
3. *Kasht-i-Alu* or a book on potato growing.
4. *Zimindari Hisab Kitab*, on farmers' book-keeping.

This land of the five rivers is fitted by nature to produce fruit of great excellence and we can easily beat California within 25 years; but we have many obstacles in the way, the greatest of which is the non-existence of a separate department of horticulture, composed of men who know their business.

QUESTION 2.—AGRICULTURAL EDUCATION.—(x) We can make agriculture attractive to the middle class youth by making his future career as an agriculturist as lucrative and as respected as others are that are open to the youth of this class. Man is a creature of heredity and environment and middle class youth is no exception to this rule. He is in many cases half educated, only a matriculate and finds his surroundings quite unattractive. The simple lives of the village folk have no fascination for him but he takes his cue from certain officers of the State, like the *Zilladar*, *Thanadar* or *Tahsildar*, who come to visit the villages now and then. He has inherited from his forefathers the farming instincts, but he finds the profession neither very lucrative nor very assuming. This is the natural conclusion that he arrives at when he compares his life as an agriculturist with those of the above-mentioned officers, who have been enlisted mostly from his own ranks, and who are in some cases his own kith and kin. He has not in his school or at his home learnt the dignity of labour and he was never brought up for life on the farm. The overbearing attitude and the easy-going lives of these officers lure the poor youth away from following the by no means easy task of an agriculturist. Government would be doing a great service to the agriculture of this country by allotting more useful work to these officers. The man-hour value of a middle-class agriculturist or zamindar should compare favourably with that of the man-hour of a *Tahsildar*. These officers in fact have not much work to do. They have secured soft jobs on handsome pay, in addition to the many possibilities of getting rich soon by other means. *Tahsildars*, for instance, had at first the income-tax and the excise officers' duties to perform; now they have none of those. Why not harness them to agricultural propaganda work? More work and less possibilities of getting rich soon, will display them in their true colours. This is, in short, how the repellent forces, magnetising adversely, can be eliminated to the minimum, and the middle class youth encouraged to adopt the natural course of taking to an agricultural life.

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But this is not enough. We should also show him the attractions of a farmer's life. Let him be initiated into the pleasures of a successful farm home. Then and then alone, the artificiality or hollowness of any other way of living will dawn upon him. For then alone, he will first of all learn the dignity of labour, acquire the habit of perseverance and feel self-confident. Unfortunately, we have, in this country, too many colleges and schools imparting education that does not fit our boys for life on the farm and too few farm homes, or farms and homes both combined. The great desideratum is the creation of such farm homes in this country. Here the youth can see for himself the opulent farmer whistling and working from sunrise to twilight, contented and happy. Here he can find a plenitude of everything, and the blessing of being not rich but being supplied with every necessity of life in abundance, to use and to spare, plenty of bread and butter, bountiful supplies of delicious fruit, fresh vegetables and beautiful flowers all the year round, pure water to drink, free air to breathe, a nice villa to live in, oceans of green verdure to feast his eyes on, prancing horses to ride, shooting, pigsticking or *kabbadi* when the long awaited harvest is in, with plenty of work to do, day in, day out, and the satisfaction of having done it well, with plenty to learn and digest in what is, in fact, the best teaching university for him and for those of his neighbours that have not so far been lured away by the outward tinsel and show of soft Government or other employers' jobs where there are no responsibilities but many possibilities of getting rich soon by other means. Life at such farms is undoubtedly worth living and can certainly prove attractive to the middle class youth and his parents. But example is better than precept. Millions of money spent upon propaganda work in order to induce the youth to start such a life cannot be such a force in attracting him to a life on the farm as the example of a man who has certain love for adventure, who is ever ready to shoulder any responsibility, who has surmounted most of his initial difficulties, who has made his holding successful and is now enjoying the pleasures of a farm home and is, on this account, better off than his neighbours, who is respected by his relations and who is also highly spoken of by the Government officials. He has in fact made a success of his life. Such an

example is simply infectious and deserves recognition as being of the greatest good to the greatest number.

QUESTION 4.—ADMINISTRATION.—(*c*) (i) No. In most cases, the knowledge of the so-called Indian agricultural expert is superficial. He has, in fact, himself done very little practical work, although he pretends to know all about agriculture, fruit, flower and vegetable gardening. From the highest to the lowest in this department, they are moving fast in a whirlpool of uncertainty. They may have won their battles in the laboratories of some institutions of great repute, but certainly not in the field laboratory of this land of the five rivers under the canopy of a scorching June sun. They are themselves not sure of their knowledge and the results of its application, as otherwise most of them would have given up their Government jobs long ago and taken to the life of a successful agriculturist, thus setting a very good example. Some have thousands of acres and they still stick to the service, thus declaring to the world by their example that agriculture can never be made so profitable and paying as the Government jobs are. Lord of about a thousand acres, and preaching to others the gospel of agricultural improvements and denying to himself the pleasures of a farm home! What a sacrifice!

Some of these agricultural experts may be specialists in one line and we want such specialists for research work, but they are blank otherwise and can never claim to be sources of inspiration to the ordinary cultivator who, in order to be successful, has to be an all-round man and expects his leader to be a man much better equipped on all the sides than himself. It does not pay the cultivator to invite so many so-called specialists for as many operations in the growing of a single crop. It is very unfortunate that even the best in the department know only one side of the picture; their knowledge of a crop is only one-sided. What we really demand is a class of practical men who, having spent some time in the laboratories, have taken to practical farming and gardening for the latter part of their lives, who can at once quote verse and chapter from their own personal experiences, men like the county agents they have in America.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*c*) Obstacles in the way of the fruit-growing industries are—

(1) The want of definite information and total absence of sound literature on this subject.
(2) The want of really capable officers having mature practical experience in this line, extending over many years of work here and abroad.
(3) The almost total absence of conscientious labour in this country.
(4) The unsympathetic and suspicious attitude of the Department of Agriculture, due to their total ignorance of the subject.
(5) Heavy water-rates and revenue charges amounting to about Rs.20 per acre annually charged twice in a year, although the trees bear fruit only once in a year.
(6) There is no reduction, nor any remission of water rates, &c., for the first four or five years of the life of a plantation when there is no fruit.
(7) Bad roads and communications.
(8) Pilfering in transit and rough handling by the railway employees.
(9) Packing difficulties.
(10) Marketing difficulties; the want of reliable commission agents in big cities.
(11) Absence of a proper medium for advertisements.
(12) Difficulties in securing adequate private capital or *taccavi* grants for gardening purposes.

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(13) Complete absence of banks like the American Federal Banks that lend money with which to pay the harvesting hands and other costs incidental to marketing.
(14) Want of facilities and of specialists for manufacturing the surplus fruit into products like jams, jellies, candied peel and canned fruits.
(15) Absence of pedigree plants and scarcity of reliable nurserymen.
(16) Heavy freight charged by railway authorities for moving nursery plants.
(17) Want of educational facilities in villages for the children of the rich, who can afford to plant gardens.
(18) Superstition amongst a certain section of the people that it is below their dignity to grow fruit or vegetables.
(19) The dignity of labour is not recognised in this country.
(20) The idea that fruit is a luxury and not a necessity.
(21) Want of self-confidence and of perseverance amongst the majority of the people.

Oral Examination.

42,433. *The Chairman*: Sardar Hardit Singh, you are a farmer and nurseryman?—Yes. You have been good enough to provide the Commission with a note of the evidence you wish to give. Would you like to add anything at this stage, or may we ask you a few questions?—I have nothing to add.

42,434. I suppose the fact is that the Agricultural Department has only recently begun to take an active interest in fruit-growing?—Yes.

42,435. In paragraph 3, you refer to the almost total absence of conscientious labour in this country. If that is true, then I suppose it would be a very difficult matter to remedy. What exactly were you thinking of when you expressed this opinion?—I can explain it in this way. I have been employing labour on my farms at Rawalpindi, Mahi-Chak, Amritsar and Lucknow for hoeing, ploughing, and so on. I have noticed that unless strict supervision is given they do not do any work. They are not paid handsomely; ordinarily they get eight or nine annas per day, but the work they turn out is not worth three annas. We may take a man who is worth Rs.20 a month and give him Rs.30 in the first month, Rs.40 in the second month, and then Rs.50 and Rs.60, and so on, but even then we find he is still unconscientious. He does not take any greater interest in his work. You will find him sitting idle whenever you go there.

42,436. So that you have to pay a good deal for supervision?—Yes.

42,437. What is your principal fruit crop?—At present it is plums, but I have introduced many new fruits into this Province.

42,438. Plums are the principal crop. How many years does it take to bring a plum tree to bearing?—Four years.

42,439. And how much water is required during each of those first four years?—Deciduous plants do not require much water; in the cold weather they are in a dormant condition, and we rarely water them. In the hot weather we water then every fifteen days, but again during the period when they are flowering we do not give them any water.

42,440. Can you give us any idea of how much water from the Irrigation Department you require to bring a plum tree to the point of bearing?—About 32 inches of water in the four years.

42,441. Is that divided equally in each year, i.e., eight inches a year?—Yes.

42,442. Although the actual water charges are not within the terms of reference of this Commission, I should like to ask you whether you think

that having regard to the particular crop in question you are being charged more for the water than the water is worth?—Yes. The principle on which the land revenue is assessed is that Government charges a share of the value, but when there is no crop for the first four or five years, there is no value at all, and I do not see why we should be charged at all.

42,443. Is it your suggestion that you should have water for nothing during the first four years?—It is the principle upon which the Government works. People sometimes construct wells in the *barani* area, and for twenty years nothing is charged.

42,444. What about the water rate?—Water rates are also charged twice a year, and they are exorbitant. For no other crop is Rs.10 per acre charged, and moreover the charge is made twice a year.

42,445. There are different rates per acre for different crops; is not that the position?—Yes.

42,446. What is the charge per acre for plums?—For fruit they charge differently, as for an orchard or garden. There is only one crop from one plant in a year, but the water rates and revenue are charged twice a year.

42,447. Have you ever compared the water rate charged per acre for deciduous fruit trees in relation to the profits per acre with the like figures for other crops, such as sugar-cane?—Not so far.

42,448. From your point of view, that really is the point, is it not: the capacity of the crop to yield a profit?—Yes, but it is the principle laid down in the Irrigation Manual that when the crop is below four annas in the rupee, nothing should be charged.

42,449. What you are concerned to get, if you can, is some remission of these charges during the period of immaturity, before bearing begins?—Yes, and also that the charge should be only once a year and not twice.

42,450. As regards packing difficulties, who creates those difficulties?—We do not get proper packing material.

42,450A. You mean to say that the packing material is not available?—That is so.

42,451. What you want, I suppose, is a good class of wood for packing cases?—Yes, good wood and wooden boxes and wrappers.

42,452. How do you market your soft fruit? In crates or closed boxes?—In closed boxes where every arrangement is made for ventilation.

42,453. Referring to marketing difficulties, you mention the want of reliable commission agents in big cities. Do you not think that this difficulty is due to the small amount of business of this kind?—I do not think so. Whether the amount of business be small or large, these difficulties still exist. We send the first consignment of fruit to some people and they say it is all right; we send the second consignment, and they say it is all rotten and spoilt in transit. I investigated a case of this kind myself at Simla when I went up there, and I found that it had not arrived in rotten condition (as they said), but that they had sold it to someone. On finding this out they had to pay me back.

42,454. You mean to say that the commission agent is corrupt?—He is undoubtedly.

42,455. You mention in paragraph 14 the want of facilities and of specialists for manufacturing the surplus fruit into products like jams, jellies, candied peels and canned fruits. Quite apart from the want of technical experts and facilities, what is the market for products of that sort in India?—There is a big market. A very large supply of these tinned products comes from California, Florida, etc.

42,456. Do Indians consume this class of dry goods?—Nowadays well-to-do people do.

42,457. But is it a fact that Indians, taking the country as a whole, have not acquired the habit of consuming jams and tinned fruits and so on?—That is true to some extent, but people are taking to this habit now.

42,458. What do you say about the quality of the fruit that you grow? Is it of a high quality?—It is of a very high quality. It has been used and appreciated by their Excellencies the Viceroy and the Governor of the Province.

42,459. What do you say about the flavour?—It is of very good flavour. I am trying to send it to England also.

42,460. What sort of fruit?—Plums and grape fruit.

42,461. You think the plums will stand the journey?—Certainly. They have been kept here for a month and they have not deteriorated.

42,462. Without cold storage?—Yes. Certain fruits ripen on the way and take colour on the way and give a better flavour. These plums and apricots have been introduced here like that.

42,463. You know that change of temperature very often upsets them?—Yes.

42,464. Have you a good report of the fruit that you sent to England?—I am going to send only this year. Now that the Air Service has been introduced I am going to ask them to carry it.

42,465. Have you had a look at the freight rates?—No; I have written to them.

42,466. You say on page 332 that the Department of Agriculture has turned out to be unsympathetc in the matter of the literature in which you embody your experience. What has the department done to disappoint you?—As they themselves know nothing about this, they cannot introduce the books and they cannot recommend them.

42,467. Do you mean to say that they will not publish them?—I would myself publish them if they would only recommend them.

42,468. In their journals?—Or give me a note saying that they might be generally used. They can send them to the co-operative societies if they like.

42,469. You suggest that some districts in this Province are capable of growing good vines?—Yes.

42,470. Is it your idea to sell the fruit of those vines or do you make wine?—I have no idea of making wine; it is only for the sake of the fruit.

42,471. Has anybody ever tried to make wine, do you know?—I do not know.

42,472. Have you many neighbours who have taken up this fruit growing?—It is like this. Seven or eight years ago I planted my first plantation, and then all my neighbours said that I was a mad fool wasting all my money on land, and that nothing would come out of it. Now that most of the varieties I had planted have turned out successful they come to me and ask for the plants, of course at present for nothing. So they are gradually starting. You know this fruit growing business cannot be done all at once.

42,473. Where did you get your plants from?—From California and Florida; grape fruit from Florida and plums from California.

42,474. Do you grow oranges?—Yes.

42,475. Limes?—Yes; the Lisbon lime has been very successful.

42,476. Would it pay you to set apart a portion of your land as a nursery garden and grow plants for sale?—Yes; I have already an acre under nursery plants, and this year I sold plants worth Rs.6,000.

42,477. Do you graft yourself?—Yes, and I can do all the different kinds of grafting.

42,478. Do you grow citrus fruits in this country?—Yes.

42,479. On what stock are they?—They are on *khutta* oranges, that is sour lemons.

42,480. *Sir James MacKenna*: Have you sent any of your grape fruit to Calcutta?—No. Out of half-a-dozen plants that I originally imported only one has been fruiting for the last two years. This year I sent some of the fruit to different persons, including Sir Geoffrey De Montmorency and Sir Malcolm Hailey, and they all say that it is very good, as good as the fruit that comes to the London market, where it is sold at 6d. each and from where it is brought to Calcutta in cold storage and sold at eight annas each, though much of its flavour is lost.

42,481. There is an increasing demand for it?—Yes. In Florida the value of the crop for the last year alone of this variety only was Rs.4 crores as against a similar figure for the value of all other citrus varieties.

42,482. In your fruit enquiries have you consulted Mr. Robertson Brown?—Yes.

42,483. Have you seen his work?—Yes.

42,484. Are your plants as good as his?—Yes.

42,485. Has he been of any help to you in the matter of advice in packing methods?—He is in the Frontier Province.

42,486. It is not very far?—But they give preference there to the people of that Province. He is a personal friend of mine and he has never refused any help to me; but I have not succeeded in growing the American peaches. I am still experimenting on them. In one year they fruit and another year they do not. I wanted to ask him about it but I could not meet him. I asked the Director of Agriculture, and nobody could help me.

42,487. I was wondering whether you had studied his methods of packing?—Yes; he was telling me that he wanted to pack them in the ordinary baskets, that they might be sent in bulk.

42,488. Of course the packing question is a difficult one?—Yes; much attention is required.

42,489. *Professor Gangulee*: Which is your chief market?—My chief markets last year were Murree and Simla; this year I am going to send the fruit chiefly to Simla and Lahore, and also to the Calcutta and Bombay markets.

42,490. Do you get any preferential rates from the railway authorities?—Not much, except that they handle it roughly on the way.

42,491. Where did you have your training in horticulture? In America?—Yes; that was 22 years ago; but I attach more value to the experience I got in this country afterwards than the training I had in America.

42,492. In your horticultural work do you get much assistance from the Department of Agriculture of the Province?—Unfortunately, they know nothing about it; they have just started these things.

42,493. Do you get any assistance from the Kumaun fruit gardens in the United Provinces? There is a Government nursery there?—I do not know about it.

42,494. What variety of plum do you grow, the Japanese variety?—Yes Some of them are also high-bred American varieties.

42,495. You had your first lot of stock from America?—Yes.

42,496. Then you made your own nursery?—Yes.

42,497. Do you have inter-cultivation?—Yes. But these plots have been granted to me with certain stipulations; one of them is that I should not inter-cultivate or grow any different crop unless I get the previous permission of the Director. So I have to apply for permission if I want to do inter-cultivation.

42,498. So far you have not done it?—Yes, I have. I grew some of these fodders, leguminous crops like berseem.

42,499. Who does your pruning work?—I do it myself.

42,500. Have you trained men for that work?—I have trained about two dozen men.

42,501. It is quite an important thing in horticulture?—Yes; pruning, spraying, cultivating, all these things are done on European lines in my garden. I am also training my children in these things. They are not going to any school. I have got a tutor at home who teaches them English and mathematics; the rest of the work I teach in the gardens. The eldest boy is only 14, and he can read and write well, prune well, spray well and plough well. He does all these things.

42,502. You spray your plants with Bordeaux mixture?—It all depends on the disease or insect, but that is generally applied.

42,503. You have no trouble with any special disease?—Not so far, I am quite immune from that because there are not many gardens close by, and the first lot was quite free from any disease, and I first spray the plants that I get.

42,504. With regard to the business of your farming, do you keep accounts, costings?—Yes to some extent.

42,505. In detail?—I do not have a clerk for this purpose. In this country, as you know, one has to do all the different operations oneself. He has got to do his research work and find out good varieties and when he has found them out he has to multiply the varieties and then graft and so on. So there is very little time left for detailed work.

42,506. You have got about 20 acres of plums?—Yes.

42,507. What is your cost of cultivation per acre?—For all the 45 acres of fruit that I have planted out, up to now the cost has worked out to something like Rs.75,000.

42,508. *Mr. Calvert*: You have also given us a copy of a booklet showing how a man can live decently on 5 acres; do you think that is quite possible?—Perfectly possible.

42,509. I suppose it is only possible if and when a person puts his brain and muscle into the 5 acres?—Yes.

42,510. Do you find vegetable growing a paying proposition?—Yes. As you know, I have been running a sullage farm in Rawalpindi for six years. In 1919 at the request of the civil authorities I undertook to supply the Commissariat people with vegetables from that plot, which consisted of 24 acres, of which 8 acres were under seepage water, and I could not grow anything on these 8 acres. Out of the 16 acres, that is, excluding the other 8 acres under seepage water, I was able to get about Rs.35,000 in one year from the supply of vegetables.

42,511. You were paying for the sullage water?—Yes.

42,512. Did they try and put up the rates against you?—Yes.

42,513. What did they ask for in the end?—They gave it to me originally for Rs.500, because nobody else would take it, and when I left it, after six years, it was auctioned by them for Rs.4,000. I could not run the show much longer, because I had to go and colonise my own land in the canal colony.

42,514. You found a good market for high-class vegetables?—Yes.

42,515. Did you find Indian gentlemen taking to a better class of vegetables?—Yes; my marrow-fat peas always sell at 12 annas a seer, while the ordinary bazaar peas are sold at 2 annas and even 1 anna a seer.

42,516. We have heard a good deal about unemployment among the middle classes. Do you think there is scope for these unemployed youths if they take off their coats and put their brains on the land?—That is the only panacea.

42,517. *Professor Gangulee*: They must have adequate capital, just as you had to begin with?—Yes, they must have liquid money as well as solid acres; in most cases they have land, but they do not care about it.

42,518. *Mr. Calvert*: You have got a grant of land from Government on fruit-growing conditions, and the land is about 50 acres, so that Government has encouraged you in the fruit industry?—Yes.

42,519. *Mr. Kamat*: With regard to fruit canning and the making of jams and jellies, I suppose there is a large amount of imported stuff coming into the country?—Yes.

42,520. If you succeeded in making jams and jellies there should be scope for that, even apart from the fact whether there is any consumption amongst Indians? Have you considered the question from that aspect?—Very great success can be achieved in this direction, but the facilities which are required are not available to us at the present moment.

42,521. What facilities do you want for jam making?—For example, as you know, I have spent about Rs.75,000 already on laying out my fruit garden, and, naturally, I would not like to put out any more money. The first thing is capital; and the second thing necessary is a proper knowledge of the business for which we want a specialist. This garden, which may also be called a Government garden, for it has been granted for 30 years, can also be started by the Government as a model canning factory, where people may come and learn both fruit growing and canning of fruit and making of jams, etc.

42,522. Given the necessary capital and the facilities that you speak of, do you think there is scope for this sort of industry in spite of the competition from Australia or California?—Yes. Fruit here is generally very cheap and labour also is equally cheap, although it is not so conscientious as it should be, so that given the proper conditions (and I do not think that much capital is necessary for jam making and canning factories) it would be easy to carry on the business, on a small scale to start with, in the form of a cottage industry. In America there are what are called home canning factories, every household possessing its own canning plant, so that we can do the very same here. Punjab has a climate more or less similar to that of California and Florida, and almost every kind of fruit can be grown here and grown cheaply.

42,523. I know a man from Poona who had gone to America and has now returned and started a jam-making factory, near Poona, with a capital of about Rs.60,000, I think?—I should think that Rs.8,000 or 10,000 or even Rs.5,000 would be sufficient to start with.

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42,524. *Professor Gangulee*: Do you know anything about the efforts being made by Government in Coonoor to start a factory there in pure jams and jellies?—No.

42,525. *Mr. Kamat*: In your booklet you say that Rs.5,000 can be got from 5 acres annually as a profit; is that by intensive fruit culture?—Not only by fruit; the 5 acres have been divided into different convenient plots, and it is only through intensive farming that one can get so much out of it.

42,526. What capital will be required for a middle-class youth to earn this Rs.5,000?—I cannot say off-hand; my idea is that, ordinarily, every farmer has got his own land, together with a certain number of oxen and milch cattle.

42,527. If they can make Rs.5,000 from 5 acres, as you say, we need not have started into this inquiry so minutely. You say the attitude of the Agricultural Department is suspicious. Suspicious in what way?—The position is like this: The agreement is that I must grow at least 100 plants on an acre. One plant will not spread as much as another; there will be differences, for example, in the case of peaches you cannot give less than 25 feet each way, and this has been often brought to their notice, but they will not understand my difficulty. They keep on saying that it is one of their stipulations that I should grow so many plants per acre. Then, again, when I ask them to supply me with some plants of other countries for the purposes of experimenting, they suggest that I am asking for these plants in order to justify the grant that has been given to me.

42,528. Speaking about the *Tahsildar*, you think he has a soft job and that he does not do work enough?—That is my idea. We have to work from early dawn to twilight, and we wish that others should do the same.

42,529. The Revenue officials do not work enough in this country?—Many people do not.

42,530. *Mr. Roberts*: In answer to the President I think you said that 32 inches of water were used in four years. Did you not mean every year?—No; in four years.

42,531. That is eight inches per annum?—Yes. It is like this: in the cold weather we do not give any watering to these deciduous plants; in the hot weather we give one watering after every 15th or 20th day and then we plough and harrow again. We do not water except by drains along the furrows. For the first four years we do not mean to water all the area.

42,532. I believe the Irrigation Department makes a special provision for gardens?—Yes, they give extra water; ordinarily they give 50 per cent. more than the usual amount.

42,533. You have no difficulty from lack of water?—No; so far as these deciduous plants are concerned, nobody can have any difficulty because three-fourths of the water that is given to cotton is required for these deciduous plants such as plums and peaches. Of course, citrus fruits require much more water, and, in fact, they require it all the year round.

42,534. Do you think the prospects of fruit growing are brighter with regard to deciduous fruits than they are with regard to evergreens?—Both can flourish here easily.

42,535. You have no strong views with regard to the one or the other?—Both are good; citrus plants are as good as deciduous.

42,536. I believe you grow a large amount of fodder. How many crops per annum do you get in the same land?—I can get three crops in the same land in a year.

42,537. Do you get an intensity of 300 per cent.?—Yes, we can.

42,538. Do you find your soil depleted at all?—Where we get three crops we manure the land properly; I am using artificial fertilisers also.

42,539. What fodder crops are you growing?—Three rotations are being adopted. Rotation No. 1 is mangel wurzel which is sown in September and harvested in May at a time when there is no other green crop for the buffaloes; it is a very heavy growing crop and the produce is large; then *moth* (a pulse crop) and maize green which are sown in June and harvested in August. The second rotation is *berseem* (Egyptian clover) which is sown in September and harvested from November to May; it gives something like six cuttings in a year, or in the six months I should say. Then *moth* and maize green which as I have said is sown in June and harvested in August. The third rotation is turnips which are sown in the end of August and they are ready in November and December for the cattle. Then there is French oats which is ready in April.

42,540. *Sir Henry Lawrence*: Have you consulted the Horticulturist at Poona in any of your difficulties?—I have not been towards that side.

42,541. You can write without going there; he is a Sikh gentleman who has also been trained in America?—Yes, I know the gentleman; he has also got a garden here. But I have not consulted him, nor has it occurred to me to do so.

42,542. *Sir Thomas Middleton*: What total area of land have you under fruit?—At present 45 acres.

42,543. What area have you under plums?—20 acres.

42,544. What is the next of your crops in importance?—Oranges.

42,545. How many acres of oranges have you?—Nine.

42,546. What is the next in importance?—Peaches.

42,547. How many acres of peaches have you?—About five. The rest is mixed: pomegranates, bananas, limes and other things.

42,548. Has the whole 50 acres been planted up?—Yes; I have to plant 35 out of that 50 acres according to the agreement.

42,549. Are the forage crops of which you have been speaking grown between the rows of trees or are they grown on the 15 acres not planted? —No, they are grown separately; between the rows of trees only such crops are grown as are not high, for example, American watermelons which grow quite well here and berseem and clovers which enrich the soil even after the crop has been removed.

42,550. Do you grow any apples in your district?—No, but I am growing pears.

42,551. What stocks are you using for the plums?—Peach stock.

42,552. Have you been paying close attention to the question of stocks? —Yes.

42,553. Do you know that that subject has been receiving a great deal of attention from horticulturists recently?—That is right.

42,554. Are you satisfied that you have uniform stock?—Peach is the best; I have also tried other stocks.

42,555. Do you raise your stock from seeds or cuttings?—From seeds; we sow the pips.

42,556. Then you cannot get them uniform?—They are quite uniform.

42,557. You are satisfied about that?—Yes; in one year we can get a grafted plant about 4 feet high from the peach stock.

42,558. But you have not yet had the trees planted long enough to know how they will develop?—Yes, at present I cannot divine that.

42,559. You made a point about the water rates in the early years; do you think it would be fair, assuming your total amount of revenue for a period of twenty years were fixed, if you had a remission in the early years and paid up the balance when the trees were bearing?—If that principle is adopted in other ways it might be adopted in this way also: for the first twenty years, when new wells are sunk, nothing is charged; I mean only *barani* rates are charged; then after that the ordinary well rates are charged.

42,560. Your idea is that if something like that were done it would promote fruit planting?—That is right.

42,561. You complain of the absence of banks like the American Federal Bank?—Yes.

42,562. I should have thought from what I have heard about banks in this Province that you would have little difficulty in borrowing on sound security?—I have spent Rs.75,000 on the garden and if I want another Rs.15,000 or Rs.10,000 nobody can tell me any bank which will advance me anything on the security of this garden.

42,563. They will not make advances to you on that security?—No, not on the security of the crops or the gardens; it may be they will do so on other securities.

42,564. Will they not even advance sufficient money to pay wages for harvesting? That is a comparatively small sum?—It is a small sum; they might make advances to me but they would not make advances to people who have small gardens.

42,565. You are not complaining of the personal difficulty but of the general difficulty?—Yes.

42,566. *The Chairman*: How much of your existing capital has been borrowed on the security of the garden?—Nothing.

42,567. *Mr. Kamat*: If you had a capital of Rs.15,000 more could you start a jam factory?—Yes, I would.

42,568. *Mr. Barron*: Where is your garden?—On the Upper Jhelum Canal.

42,569. How long have you held it?—I got it about five years back, but I had two rectangles of land before that in the same village where I planted my first garden; I planted nine acres first.

42,570. Is there any condition in the terms of your grant about remission of land revenue and water rate for the first two years of the tenancy?—There is no stipulation of that sort.

42,571. Has your land previously been cultivated?—No; I had all the brushwood cut; the first spade work was done by me; it had not been cultivated. It had been given on temporary cultivation to certain people, but they did not remove the stumps or do anything.

42,572. But it had been previously cultivated?—Yes.

42,573. Then you would not have to break it up?—It had to be broken up; it was under temporary cultivation, but these people did not remove any of the stumps, they did not level it, they did not do anything.

42,574. They may have been bad cultivators, but you know that, as a rule, when unbroken land is given out for the first time, remission of land revenue and water rates is given for the first two years?—Yes, we got that remission for one year; that is given to everybody.

42,575. You did get that?—That is for one year only; whether we plant trees or grow any other crop they remit for one year.

42,576. Were you growing fodder crops and vegetables on the land in those years?—No.

42,577. Why not?—I cannot grow them without the permission of the Director, and even if I get permission I could not get sufficient labour to grow vegetables between the trees.

42,578. During these five years, how often have you asked to be allowed to inter-crop?—Whenever I have asked them they have given me permission.

42,579. They have never refused you permission?—No, I do not say they have.

42,580. Then what is you grievance?—I have to get permission from them; sometimes they refuse some of the crops.

42,581. Where did you learn fruit farming?—Mostly here, by experimenting, and first I went to America.

42,582. How long were you in America?—Two years.

42,583. You say you have not been able to get any assistance from the Department of Agriculture regarding fruit trees?—No assistance; for instance, I cannot get my American peaches to fruit, and nobody comes and tells me how to do it.

42,584. Have you consulted the Government gardener at Lahore who goes in for fruit?—Which is the Government gardener?

42,585. You do not even know of the existence of a Government gardener in Lahore?—Do you mean the Horticulturist who has newly been appointed?

42,586. No. There has been a Government gardener here for years?—The Lawrence gardener?

42,587. Yes?—I know him.

42,588. Have you ever consulted him?—I have consulted him many times.

42,589. Was he able to give you any advice?—None; in fact the fruit which has been grown here is much inferior to what we grow.

42,590. *The Chairman*: Have you been using any artificial fertiliser?—Yes.

42,591. What sort?—Superphosphate and potassium nitrate.

42,592. Have you been successful with these manures?—Yes.

42,593. Are you using any organic manure, any cowdung?—Organic manure used by me is the ordinary cattle dung. Now that the garden is big enough I adopt the system of growing leguminous crops between the plants and trees. I take two or three cuttings for my cattle, and when the fodder is in blossom I plough it down.

42,594. You plough it in?—Yes.

42,595. And use it as green manure?—That is right.

(The witness withdrew.)

The Commission then adjourned till Wednesday, the 2nd March, 1927, at 10 a.m.

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Wednesday, March 2nd, 1927.

LAHORE.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.
Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S. } (*Co-opted Members*).
Mr. W. ROBERTS, B.Sc. }
Mr. J. A. MADAN, I.C.S. } (*Joint Secretaries*).
Mr. F. W. H. SMITH. }

Sir GEORGE ANDERSON, M.A., Kt., C.I.E., Director of Public Instruction, Punjab.

Replies to the Questionnaire.

QUESTION 23.—GENERAL EDUCATION.—I shall confine my remarks to Question 23, which deals with the problems of general education. I have already tried to describe the general position in the Punjab in the memorandum which was prepared by the Punjab Government, and which will be found on pages 239-251 of that Government's "Memorandum for the Royal Commission."

2. It is undoubted that the system of education (especially of vernacular education in rural areas) has a very distinct bearing not only on agricultural efficiency, but also on the general conditions of rural life and of its development. The main limitations of the system appear to me as follows.

3. *Expansion.*—Agricultural and rural development can scarcely be expected to prosper so long as the countryside is immersed in illiteracy. A rapid expansion of vernacular education is therefore essential. In this limited respect, at any rate, considerable progress has been made in recent years in the Punjab, as will be seen from the following enrolment figures for the last five years:—

Year.	*Enrolment.*	*Increase.*
1920-21	556,989	—
1921-22	626,690	69,701
1922-23	776,978	150,288
1923-24	841,906	64,928
1924-25	919,649	77,743
1925-26	1,062,816	143,167

Thus, the enrolment has increased from 556,989 in 1920-21 to 1,062,816 in 1925-26, or an increase of 505,827 pupils. The following figures show the percentage of boys at school to the total male population for the last six years:—

Year.	*Percentage.*
1917-18	3·72
1918-19	3·78
1919-20	4·14
1920-21	4·26
1921-22	4·77
1922-23	6·04
1923-24	6·6
1924-25	7·28
1925-26	8·44

4. In his report for 1924-25, Mr. Richey estimated that it will take India forty years at the present rate of expansion to reach the goal of universal education for boys. Between 1920-21 and 1924-25, India recorded an increased proportion of ·25 per cent. of boys at school to the total male population on the average in each year. The India percentage of 1924-25 was 6; and thus the progress from 6 to 15 per cent. would take $9 \times 4 = 36$ years. An additional four years was added to meet the normal increase in the population. In the Punjab, the increased proportion was ·75 as against ·25 in India on the average in each of the same four years. The percentage in 1925-26 in the Punjab was 8·44, and thus to reach 15 would take $(15 - 8{\cdot}44)\ 6{\cdot}56/{\cdot}75 = 9$ years to reach the normal 15 per cent. As the adult pupils (about 85,000) are included in our figures and are considerably more numerous than elsewhere in India, the number of years required would be about 11. But, in present conditions, it is beyond the range of practical politics to anticipate universal education, and it would therefore be safer to aim at 80 per cent. of the boys of school-going age being at school; or 12 per cent. of the male population. At the rate of increase during 1920-21 and 1924-25, it would take $3{\cdot}75 \div {\cdot}75 = 5$ years. Taking into account the adults and the normal increase in the population, six years should be a reasonable estimate.

5. In the matter of mere expansion, therefore, the Punjab is in a fortunate position in that about 80 per cent. of the boys of school-going age should be enrolled at school within a reasonable period of time. This rapid expansion has been due in the main to the policy of the Punjab Government which aims at an encouragement of rural areas. This policy is explained in paragraphs 6-11 on pages 241-245 of the previous memorandum referred to above. The main means of encouraging rural areas which have been employed are:—

(*a*) the assessment of grants for vernacular education in accordance with the needs rather than with the wealth of each area;

(*b*) the encouragement of local recruits to seek admission to vernacular training institutions by the amalgamation of vernacular training classes with local Government high schools; the provincialisation of as many as 57 high schools within the last five years; a less unequal distribution of facilities for secondary education throughout the province; and the institution of intermediate colleges.

The main problem is therefore not one of mere expansion in numbers, but rather that the teaching shall be more effective and that the increased enrolment shall be reflected more successfully by increased literacy. The following figures suggest disappointing results, but it should be remembered that a very large number of the new pupils who have recently been admitted to school have inevitably found their places at first in the first class.

Year.	I Class.	II Class.	III Class.	IV Class.
1922-23 ...	313,608	99,899	75,402	57,221
1923-24 ...	317,520	108,269	78,871	64,229
1924-25 ...	338,849	121,505	86,450	67,442
1925-26 ...	409,644	140,249	93,490	73,720

6. The general policy of the Punjab in this respect has been:—

(*a*) To expand and to improve the existing schools rather than to multiply the number of one-teacher schools, with the result that the number of extravagant and ineffective one-teacher schools has been reduced from 2,754 in 1922 to about 600 to-day. This has been rendered

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possible in most cases by the increased enrolment which has justified an additional teacher or teachers. The Punjab Government has been giving special assistance towards the entertainment of additional teachers. For example, in the present year, special grants were given to district boards for the employment of as many as 1,000 additional teachers.

(*b*) The substitution of branch schools for one-teacher schools. A branch school differs from a one-teacher school in that it comes under the supervision of the main school and comprises only one or two classes, the object being to provide teaching for young children until they are old enough to walk to the main school.

(*c*) The improvement in the status of vernacular schools by converting primary into lower middle schools (with six classes), and lower middle into full middle schools with eight classes, the assumption being that the teaching is far better in middle than in primary schools and that, in consequence, the period of school life is longer and the attendance more regular in a middle than in a primary school. 290 primary schools were converted into lower middle schools in 1924-25, and 525 in 1925-26. The greater stability of the Punjab system is reflected in the following figures for 1924-25; but it should be remembered that 525 primary schools were converted into lower middle schools in 1925-26 and therefore the position is more satisfactory at the present time.

Province.	*Pupils in middle schools.*	*Pupils in primary schools.*
Bengal	133,356	1,310,064
United Provinces	57,322	921,882
Punjab	235,895	353,258
Bihar and Orissa	43,889	797,469
Central Provinces	71,977	246,256
Assam	25,962	184,141

(*see* Questions 42,830-42,833.)

7. Though improvements can be made in the effectiveness of the teaching by the measures discussed above, the most potent means of improvement is an extensive application of compulsion, a matter to which the Commission has drawn particular attention in its Question 23 (*b*) (*ii*). In the Punjab, compulsion is now in operation in 44 urban and in 850 rural areas. The main benefit to be derived from a satisfactory application of compulsion is the retention of boys at school for a sufficiently long period of time to enable them to gain a firm grasp of literacy. As such, compulsion should be a guarantee that the money devoted to vernacular education is spent in the most fruitful manner. It is thus not an ideal to be attained in the distant future but a present and a practical means of improving the existing schools and of removing illiteracy. Though it may seem a paradox, compulsion in India can only prosper if it is voluntary. It is scarcely advisable to let loose on the countryside a horde of corrupt and subordinate officials in the form of attendance officers. Such a policy would blunt the enthusiasm for education which exists to-day. The main purport of compulsion, therefore, is the insistance that all boys who come to school shall remain there for the full primary period at least. In arranging which school shall be improved in status, we give preference to those areas which apply for compulsion. Again, compulsion should be grafted on the existing voluntary system and should not be regarded as something new. If new programmes for compulsion are formulated on the basis of a fixed measure of Government assistance to each district (as is done in other Provinces), then the rich will benefit at the expense of the poor under the guise of compulsion. In the Punjab, the expenditure on compulsion is included in the normal expenditure on vernacular education and Government contributes

in accordance with the grading of each district. The cost of compulsion can easily be exaggerated. If its effect is to prolong the duration of school life, then it follows that the half and quarter filled upper primary classes can be filled with comparatively small additional expenditure.

8. The first important problem of vernacular education, then, is to provide that the teaching shall become more effective whereby the forces of illiteracy will be reduced. As already stated, this can best be done by a rapid expansion of the compulsory principle, by the elimination of the one-teacher, four-class school, and by the conversion of primary into middle schools. By this means a far larger proportion of boys in rural primary schools should complete the primary stage. The ultimate object of the Punjab Government is that the vernacular system should comprise:—

(*a*) middle schools with eight classes,
(*b*) primary schools with six classes, and
(*c*) branch schools to fill in the gaps;

and a very large proportion of these schools should be under compulsion. When this policy has been carried out, then it is anticipated that the distribution of pupils between the four primary classes will become far more uniform than it is at present.

9. The second main problem of vernacular education is that the teaching in the schools shall be less of a mystery and more of a reality, that school life shall exercise a permanent influence on the pupils after they leave school and enter upon their several occupations, and that it shall lead the boys towards, and not away from, practical pursuits. This matter has been dealt with in paragraphs 12-18 in pages 245-251 of the Punjab Government's Memorandum. The main features of this policy are as follows:—

(*a*) Attempts are being made to adapt the courses of rural schools to rural requirements in accordance with the opinions of a Committee which was appointed in 1923 to consider this question. The main conclusions are as follows:—

> "In regard to primary schools, the subject-matter taught and the methods of instruction pursued should be such as to bring the work of a primary school into the closest relation with the life and experience of the pupils. In the second place, the acquisition of suitable knowledge and the attainment of literacy should be the main objects of the course. The central subject should therefore be the reading lesson supplemented by oral instruction, which should have the dual object of imparting to the pupils the capacity to read and to understand simple books, and also of making them familiar with such useful and general knowledge as will equip them for a fuller and wider life than is now possible with the present courses and rigid methods of teaching.
>
> "In regard to middle schools, the central subject of study should be that of Rural Science, which should co-ordinate and vitalise many subjects already included in the curriculum. It would therefore embrace physical geography; local geography; agriculture; rural economics, mainly the elementary principles of co-operation; rural hygiene and sanitation; and elementary civics."

(*b*) The original intention was immediately to revise the courses and to prepare more suitable text-books and readers, but it soon became clear that such action would be inadvisable unless and until the village teachers understood the spirit of the New Learning. The only possibility of success is to begin with the teacher and to end with the text-book. These new methods of training village teachers were first started by the American Presbyterian Mission at Moga, but they have now been applied in all vernacular training institutions, more particularly in those at Gakhar and Gurgaon. The nature of the training has therefore been transformed by the decision to limit it no longer to the prescribed scheme of studies, but rather to widen its scope by the inclusion of activities known under the

generic title of community work. It is by active participation in the healthful activities of village life during their course of training that the teachers of the future will learn to take their rightful place in the progress of rural conditions. The students under training are therefore kept in intimate contact with all the problems of village life by actual participation in works of improvement in the neighbouring villages.

(*c*) Agricultural training in vernacular middle schools. One of the earliest attempts of the Punjab Government to vitalise its scheme of rural education was the inclusion of agriculture as a subject of study in many of the vernacular middle schools of the Province, which innovation was started in 1919. The main features of the Punjab system, which differs materially from the systems obtaining in other Provinces are explained in the Circular Memo. No. 1125-G. S., dated September 20, 1923, and are as follows:—

> It was decided to include, and to provide for, teaching in agriculture in the ordinary vernacular schools rather than to start separate agricultural schools of a special type. There are many cogent reasons in support of this decision. In the first place, separate agricultural schools are very expensive. In the second place, specialised training for boys below the age of seventeen is premature. And, above all, a sound and suitable measure of general education should be the basis of all specialised and vocational training. The aim of the Punjab Government is therefore to enrich the middle school course in rural areas by the inclusion of agricultural training and thus to bring it more in keeping with the environment of the pupils; and the object is to use agriculture as a means of mental discipline and training and as an important accessory to the general subjects taught in those schools.
>
> The training is of a practical as well as of a theoretical nature. For the fulfilment of this object, farms of about three acres each are attached to those schools, in which this form of training is imparted. In 1923, owing to the financial stringency which then prevailed, an alternative was adopted in the form of miniature farms or school gardens. With the exception of a *beldar*, who looks after the bullocks, all the work of the farms is done by the boys.
>
> The teaching is in the hands of trained and carefully selected teachers who have first taken the ordinary senior vernacular training course and have then completed a special course in agriculture at the Agricultural College, Lyallpur. By this means the necessary co-operation between the Departments of Agriculture and Education is promoted.

Provision is being made in next year's budget whereby there will be 60 farms and 60 gardens. Many of these farms and gardens are now self-supporting and show an annual balance to their credit. The general supervision of these farms of activity is in the hands of the Adviser in Agricultural Training, whose headquarters are at the Agricultural College, Lyallpur.

(*d*) Adult Schools. On March 31, 1926, there were 3,208 schools and 85,422 adult pupils. The teaching of these adults is conducted mainly by certain teachers in the day schools who receive an allowance for the purpose. As is also the case with boys' schools, the danger is that these adult pupils will soon relapse into illiteracy unless suitable means are provided whereby they shall make use of their hard won literacy. About 1,600 village libraries, therefore, have now been started, and annual grants are awarded to them. One of the teachers also receives an allowance as librarian, his main duties being to supervise the working of the library and from time to time to read appropriate pamphlets and books with the villagers and to stimulate discussions. Owing to the liberality of the Red Cross Society, there are a number of lanterns in each district, which are placed under the supervision of an authority known as the District Community Council. Grants are given to each District Community Council for the purchase of suitable

slides. Importance also is attached to the provision of healthy recreation in villages; and twenty young men with Anglo-vernacular teaching qualifications are now receiving a specialised course of training at the Central Training College in order to be qualified to hold the post of district physical training supervisor. It is suggested that the village library and the village recreation ground should be rallying points in the improvement of rural conditions.

Oral Evidence.

42,596. *The Chairman*: Sir George Anderson, you are Director of Public Instruction, Punjab?—Yes.

42,597. You have provided the Commission with a note of the evidence which you wish to give us. Do you desire at this stage to say anything in extension of that note or may we ask some questions?—I consider the expansion of vernacular education to be of very great importance, with certain provisos. In the first place, it should be effective and should make some real effect on the removal of illiteracy. In the second place, expansion should be uniform, and therefore particular attention should be paid to rural, and, in particular, to backward, areas. And, in the third place, rural education should be adapted as far as possible to rural conditions and requirements. These are the three points that I wish to emphasise.

42,598. On page 346 of your note, in answer to our Question 23, after giving the details of the calculation, you come to the view: "Taking into account the adults and the normal increase in the population, six years should be a reasonable estimate." In making these calculations, have you regarded the last 50 per cent. as being as easy to catch as the first 50 per cent.?—No; it will be considerably more difficult.

42,599. Is that likely to vitiate the calculations to any important extent?—I think we should get 80 per cent. all right in about five or six years; but it is questionable whether the remaining 20 per cent. will come to school with the same readiness. I have taken the average rate of expansion in the last five or six years. We increase our numbers by about 100,000 a year, and if we continue at that rate we shall arrive at this result in the succeeding five or six years.

42,600. How about the leakage between the bottom and the top of the primary system? Do you see much prospect of it diminishing?—I think so. The leakage is very serious. In the first place, I am of opinion that the one-teacher school is almost worse than useless. It should be regarded as a waste of money. We have counteracted it to this extent, that whereas we had about 3,000 of such schools five years ago, we have now only about 500 or 600. That is the first step. In the second place, we have instituted, as I have tried to show, what we call the branch school, which is different from the one-teacher school, because it is under the general supervision of the parent school and because it caters for only one or two classes. Again, we are very anxious to improve the proportion of middle schools; that is, schools where there are six or eight classes and in which there is very much better tuition than in the four-class primary schools. As shown by the figures of the last two or three years, we have now a very much larger proportion of primary pupils reading in middle schools than in the primary schools. You see some figures quoted on page 347.

42,601. What is primary education costing a parent in the Punjab to-day?—It is almost negligible. I do not think the fees come to more than a lakh or so in the whole of the Province. There are so many exemptions, remissions and so forth.

42,602. Would it be possible, do you think, to encourage attendance and encourage the keeping of children at school throughout the primary stage

by making a charge for education and returning it to the parent after the boy has been completely through the system?—The parent is rather reluctant. I am impressed by the large waste of public funds involved by the great leakage between the 1st and the 4th class. Compulsion is a far more effective means of checking this defect, the object of compulsion being, not so much to bring additional boys to school because they are coming in quickly enough already, but rather to ensure that those boys who are at school shall remain at school until they are literate. We find the results of the application of compulsion quite hopeful in the Punjab. We have already introduced it in a thousand areas, our principle being that if a parent sends his boy to school he should give a guarantee that his son will stay long enough to benefit by the instruction. This is the best way, in my opinion, of counteracting that leakage.

42,603. Then you give it as your view that though you have compulsion, you should not employ attendance officers to go round the houses and see that the boys are sent to the school?—Yes.

42,604. You are concerned with the danger of upsetting public opinion?—I am nervous of flooding the countryside with a number of attendance officers who may not be very discreet.

42,605. But you would bring pressure to bear on a parent who has already sent his child to the school?—Yes, that is much more likely to work and our experience is that the boys are remaining for a longer period. We went to a school the other day and found that 95 per cent. of the boys were attending the school.

42,606. In some quarters it has been suggested that they should teach farming in the primary school; what do you think of it?—In the middle school stage agriculture and many other such subjects should undoubtedly form an important part of the curriculum, but not to the same extent in the primary school.

42,607. How about manual training, training in the handicrafts, the development of the hand and the eye?—We are in favour of such forms of training.

42,608. Are you pushing that?—Yes.

42,609. Is that proving a success?—Yes, it is proving a success; but owing to the separation of industrial from general education we have not got suitable Inspectors. If we could use the services of the Inspectors of the Department of Industries to assist us in supervising our manual training, we could improve very considerably. We need more expert supervision.

42,610. In equipment?—We get assistance in the purchase of equipment.

42,611. Do you find that the Indian boy takes readily to instruction in that class of work?—Yes; it is quite popular. The boys take to it well. They are not very careful of equipment and material.

42,612. Have any boys ever been careful of equipment? I suppose it is the case that many of these boys will have nothing in their homes with which to teach themselves; is that an important consideration?—Yes; I think it is very essential that we should develop this method of training in the schools.

42,613. Would you say that many of the boys are lacking in the capacity to use their hands?—Certainly. In our training schools we insist on the teachers under training doing a great deal of manual training.

42,614. It would appear that it is lack of opportunity and not lack of natural or inborn capacity?—Yes, it is lack of opportunity. We have here a list of handicrafts; it is only for one institution. These are tailoring, book-binding, dyeing, rope-twisting, caning of chairs, wood painting, shaving, cooking and so on.

42,615. How about nature study? Have you had difficulty in getti teachers?—The training of teachers is the most important aspect of the problem. We have not yet revised to any extent the courses in our middle schools, but our aim is to introduce physical geography, agriculture, rural economics (mainly the elementary principles of co-operative work), and village sanitation. We shall probably teach these subjects on the project method. But it is useless to revise the courses until the teachers understand the spirit of the new learning. We are therefore devoting our time and energy at present to the training of some 2,500 vernacular teachers in order to teach these subjects. If education in rural areas develops along the lines of urban education, then I am quite sure that your Commission will have much difficulty in effecting reforms. It is therefore essential that the methods of training in vernacular teaching should be adapted to rural needs and requirements.

42,616. When did you first have compulsion in the rural areas?—About four years ago.

42,617. So that you have hardly had enough time to measure the full effect of it?—We have had time to estimate the increased enrolment, but not enough time to arrive at any decided opinion as to whether compulsion will keep the boys at school for the full primary period.

42,618. Are the indications hopeful?—Yes.

42,619. Do you regard the whole of the Punjab as ready for the principle of compulsion?—I would not say the whole of the Punjab, but it is surprising indeed that the backward areas applied for compulsion so vigorously.

42,620. *Sir Henry Lawrence*: Even with regard to the girls?—No.

42,621. Can you give us some indication as to what proportion of boys who take up practical agriculture in Vernacular Middle Schools subsequently go back to their farms?—I have figures from a specimen district with me here which show that 134 boys have taken agriculture and passed out of the school; 51 of these are agriculturists, 14 are actually engaged in agriculture, two are patwaris, and 28 are teachers who have had their training in the way I have described and are now teaching in village schools.

42,622. I suppose, as the position stands at the present moment, you would expect an important proportion of those boys to go into the Agricultural Service?—It is not so much the Agricultural Department as the Education Department which absorbs these boys. I have figures here to show that in the schools which teach agriculture 6,616 out of a total of 8,759 boys are taking agriculture.

42,623. How long has this system in the middle schools been in existence now?—About eight years. We did not do much at first because of the financial stringency, but we have developed the system considerably in later years.

42,624. Has it been in vogue long enough to enable you to judge of its success?—The prospects are distinctly promising; the boys take to it with considerable readiness.

42,625. So that on the whole the indications are promising?—Decidedly so. Of course, as I have said, we want to develop the system more widely and to take up village sanitation, elementary credit, and so on. As soon as we have trained the teachers who can teach these subjects, we shall push on with it. We find that these farms are of some value also as subsidiary demonstration farms, as the farmers in the vicinity take interest and invite advice from the agricultural teachers as to the purchase of implements, seed and so forth.

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42,626. Attached to some of your schools you have farms and gardens?—There are 46 farms and 44 gardens.

42,627. There is a danger, I take it, if the farms were not well managed in the district, of cultivators drawing their own conclusions after looking over the fence?—Yes, they are likely to be critical.

42,628. Still, that is of some benefit, inasmuch as it should keep the teacher up to the mark?—Yes.

42,629. Do you expect female education to make any rapid headway in the immediate future?—Yes; in the towns it is expanding with considerable rapidity, but the development of the education of girls in rural areas is a very difficult problem. We are naturally confronted with the difficulty of providing accommodation and other amenities for the teachers. We are trying to develop co-education in the primary stage, that is to say, little girls should go to school with their brothers.

42,630. Would you have male or female teachers?—If we can manage it, we should certainly like to have female teachers.

42,631. Have you any difficulty in engaging female teachers in this Province?—We have no difficulty in recruiting girls for training, but the real difficulty is to induce them after training to go out into the villages.

42,632. I suppose life there would be very difficult for them?—Yes.

42,633. Have you had in this Province any tests designed to discover what the proportion of those who have once been literate and have relapsed into illiteracy may be?—There has been no such test, but, village conditions being what they are, relapse into illiteracy must be considerable.

42,634. Even in the case of those who go through the four standards in the primary system?—The lower middle school boy who reaches class VI has a good grasp of literacy, and therefore we are concentrating attention on the lower classes whose boys often relapse into illiteracy. We also attach considerable importance to the 1,500 village libraries which we have instituted, and we also have great hopes that the librarians who are being trained now in the Normal schools will be of assistance. The business of the librarian is to read pamphlets to the villagers and boys and to promote discussions with them.

42,635. Is an entirely illiterate home a cause contributory to the relapse into illiteracy?—Yes.

42,636. Do you think that the spread of female education, when it comes, will tend very much to counter the tendency towards relapse?—Certainly.

42,637. Is it the entirely illiterate mother who is to some extent responsible for this illiteracy?—Yes.

42,638. You present some very interesting facts about the system of adult education with which you are engaged. Are these centres of adult education showing vitality and staying power?—Yes, if they are followed up by the librarians with good books, pamphlets, and so forth. I have some of these books with me here as samples.

42,639. Do newspapers penetrate into the remote villages?—Yes, but they are not always of the most desirable type.

42,640. At any rate there is something for them to read?—Yes. And we have made available a number of pamphlets, some of which are sent to us by the Co-operative Department. We have also an institution called the Rural Community Board, which has rupees one lakh of recurring expenditure at its disposal. We spend a certain amount of that money in giving allowances to these librarians; in giving magic lantern shows; in subscriptions to journals, such as the co-operative and agricultural

journals. These pamphlets and journals are distributed to the 1,500 libraries. The Rural Community Board consists of the heads of departments concerned, such as the Registrar, Co-operative Credit Societies, the Director of Public Health, the Director of Public Instruction, and so forth.

42,641. How many books do each of these libraries contain as a rule?—They have only just started and have from about 100 to 150 books; but the most important part of the library is the collection of these pamphlets. It is open to any department to send us their pamphlets, which we distribute to the various libraries.

42,642. How do you satisfy yourselves that there is a demand in any particular centre for adult education? Do you make a preliminary survey?—We are advised by the inspecting staff.

42,643. The movement was to some extent initiated by the co-operative organisation, was it not?—They assisted very considerably.

42,644. They of course had the advantage of being able to judge from the formation of an adult education society that there was a demand?—The Co-operative Department should give a clear idea as to whether or not the people would appreciate a library or an adult class.

42,645. Do any of the adult classes peter out?—Yes; an adult class need not be of a permanent nature. In the course of time as the people become literate, the adult school should give way to the village library. The adult school in itself is not of much value, unless it is followed up by the library and discussions, lantern lectures and so forth; that is to my mind essential.

42,646. Would bulletins posted up outside the post office, where one exists, or on the house of a representative of Government, where no post office exists, be of any value?—The village school is the post office as a rule, and posters are used in the school libraries.

42,647. Do you think that is capable of development?—Very much so; the more the departments concerned send us bulletins, the more shall we be satisfied; we hold it to be our business to be the propaganda agency for these other departments because we can get the people gathered together.

42,648. Do persons attending these classes in adult education learn to write as well as to read?—Yes; they learn to write; they also learn to figure, which is very important to enable them to look after their accounts, especially those with the moneylender. Requests are often made for assistance to be given to the villagers in understanding these accounts.

42,649. They do attain a reasonable standard of efficiency before they leave?—We have a system of awarding literacy certificates; I cannot say very much about the standard of efficiency because we have not had sufficient time. A large number manage to gain literacy certificates.

42,650. What is the cost of your adult education?—The cost to Government is about 1¼ lakhs; it is very cheap. This expenditure is almost entirely in the form of allowances to the teachers. In addition, the Rural Community Board has one lakh of rupees at its disposal.

42,651. What does it cost the students?—A negligible amount. We also give recurring allotments to these libraries which are not only for books but for oil, lighting and so forth.

42,652. Do you see any diminution in the desire to learn English?—Unfortunately not; the pressure to start optional English classes in vernacular middle schools is very great; we try to resist the pressure as much as we can.

42,653. Do you think you are likely to be successful?—Yes, to some extent, because in regulating admissions to our training institutions we

give preference to those who have taken the pure vernacular course, and especially to those who have taken agriculture, because a matriculate is not likely to be in harmony with village conditions. Further, the matriculate spends much time in learning languages such as English, Persian, Sanskrit, and so forth. We are of opinion that the boy who has completed the pure vernacular course is much more mentally alert than a boy who has taken the Anglo-vernacular course; that is my impression, which is shared by Inspectors who know more about the matter than I do.

42,654. *Sir James MacKenna*: Have you had any experience of the contracting-in system in the Punjab; we have heard from various Directors of Public Instruction that they understood experiments of that kind had been made in the Punjab: it is a system by which a parent contracts to keep his child at school for a certain period?—Yes.

42,655. Do you think that would be of general application?—I think it must be supplementary, but it is a very valuable supplement.

42,656. Contracting-in is a part of the co-operative compulsory education scheme, is it?—Yes.

42,657. Has it worked all right?—Yes, I think the results have been quite satisfactory.

42,658. *Professor Gangulee*: In other Provinces we have been told that there are a number of difficulties in the way of introducing compulsory free primary education; in the Punjab I see you are in favour of widespread application of the principle of free compulsory primary education?—Yes.

42,659. Will you kindly tell us what are the chief difficulties you find in the way of applying this principle of free compulsory education?—I do not think that there are any grave difficulties. The number of rural areas under compulsion has increased from 400 to 900 in eleven months.

42,660. So that it is not the apathy of the people?—No, I do not think so.

42,661. Is there any administrative difficulty in enforcing regular attendance and so on?—No, so long as we do not worry to an excessive extent about the last 10 per cent. of the boys.

42,662. Is there any financial difficulty?—No, it is an economy, as money is spent much more effectively than in the voluntary system. The financial difficulty is the waste of money under the voluntary system.

42,663. You tell us on page 347 that compulsion in India can only prosper if it is voluntary. Will you kindly explain that?—Government cannot force a local body to introduce compulsion, and it is inadvisable also for a local body to force people to apply for compulsion. We give preference in many ways to those who apply compulsion satisfactorily. For example, we give such preference, when we are improving the status of a school from a primary to a lower middle school, to those who are enforcing compulsion.

42,664. What is the attitude of the District Boards towards this compulsory education?—Some District Boards are rather apathetic in the matter, but the people very often counteract that apathy by applying for compulsion. District Boards have rather a wrong idea of finance in certain matters; they think compulsion will involve them in great expense. Compulsion is an economy, as the money is spent much more effectively.

42,665. With reference to primary education, do you think completion of the primary course, that is, up to the fourth standard, gives the people a firm grasp of literacy?—That is a little optimistic, as I am doubtful whether it is a permanent grasp. I should prefer a school of six classes.

42,666. Is the number of lower middle classes, that is, schools with six classes, increasing or decreasing?—Increasing enormously, as I have pointed out.

42,667. Those are the schools in which you have six classes instead of four?—Yes; and the teaching in these schools should be much more effective.

42,668. You told us about these branch schools to fill in the gaps between the middle schools with eight classes and the primary schools with six classes. Will you tell us a little more about these branch schools?—A branch school consists of one or two classes and is under the general supervision of the parent school; its object is to provide education for those small boys who cannot walk to and from the main school.

42,669. Are there many such branch schools?—A very large number.

42,670. Do you have trouble with communal primary schools here? Is the number increasing?—We have no communal schools in the primary stage; but in the secondary stage there are a large number on the Anglo-vernacular side. These communal schools are usually aided by Government.

42,671. Do you think these communal schools may in future present a very difficult problem?—I think all communal matters are very difficult; certainly, communal schools must present difficulties.

42,672. Is it the policy of the Government to encourage communal schools?—I think not. The Government Review * says: "It seems only too true also that some of these schools encourage an unhealthy spirit of competition in the educational system, a spirit which is all the more to be deplored at a time when communal relations in general are none too cordial. The Director of Public Instruction is therefore requested to obtain more detailed and reliable information, and after consultation with those concerned to forward his proposals to Government." I think that these schools breed rather a narrow atmosphere. The publicly-managed school is preferable and also possibly more economical. It is more economical to have one large and well-managed school than to have five communal schools competing with each other.

42,673. We have heard a great deal about Moga; do you think the system followed there could be adopted throughout the Province?—It has been adopted and extended; and the Moga system now prevails in every training institution for vernacular teachers in the Province, where the teachers are trained in community work and service.

42,674. To impress upon them the dignity of labour and also to give them a rural outlook?—Yes.

42,675. You have no difficulty in getting teachers as they have in Moga? In Moga they have teachers of first-class merit?—They are very good.

42,676. In your schools do you experience any difficulty in getting teachers of the same calibre?—I think we can find them. This is a matter which we are considering at the present moment and Mr. Sanderson is investigating the case. We have already got a number of teachers who enter into the spirit of the scheme with commendable energy, and we hope satisfactorily to fill the places of others who do not show such commendable energy. I hope it may be possible for the Commission to visit our school at Gakhar and judge for themselves the capacity of the headmaster. There are many others who are showing considerable zeal, and take very quickly to this community work.

42,677. As regards adult education, have you been able to develop adult education as a system, not as they do in Bengal, by occasional spasmodic efforts?—Yes, I think so.

42,678. You have definite curricula and definite methods?—I am not keen about definite curricula, because in an adult school the pupil should pursue his own bent. Some go faster than others and a pupil should not be kept back until the others have mastered a particular reader.

* Report on the Progress of Education in the Punjab for 1925-26.

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42,679. Do you give any certificates?—Yes.

42,680. Do these pupils who attend your adult schools realise the value of such certificates?—They value the learning which they receive, but I do not know if they value the certificates or not.

42,681. Have you any idea if these certificates would give them preference in getting service?—I could not say. We are not so anxious to encourage these gentlemen of middle age to go into service.

42,682. Do you find any non-official agencies helping you in your adult education work?—No. Such agencies work in urban rather than in rural areas.

42,683. Do you get any assistance from any social service league?—They may help in the towns, but not in the villages. Indeed, I would like to add a word about these excellent organisations. They might do this work more profitably than running their communal schools.

42,684. *Mr. Calvert*: As to the question of agriculture in the middle schools, what is the additional cost involved (capital and recurring) in adding agriculture to the middle school course?—For the 45 farms and 45 plots now in existence the capital cost is Rs.1,27,000 and the recurring cost for three years is Rs.24,000, thus making a total of Rs.1,51,000, both capital and recurring.

42,685. Which means Rs.240 per annum per school recurring?—No, the figure is for 90 schools, Rs.1,27,000 capital and recurring cost Rs.24,000 for three years. The capital cost of a farm is a maximum of Rs.2,500. As you are aware, a great deal depends upon the acquisition of land.

42,686. That gives you, at 6 per cent., Rs.150 interest charges on your capital?—Yes.

42,687. Rs.24,000 for three years recurring means Rs.8,000 per year?—Yes.

42,688. Which works out to Rs.90 per year for a school?—Yes.

42,689. How many pupils have you in the schools?—We have about 8,000 in those 90 schools altogether.

42,690. The actual additional charge of adding this agricultural section is very small per pupil per year?—Yes. Some of these, of course, make a profit. Excluding interest charges and excluding the allowance of Rs.10 for a teacher, about 40 per cent. of these schools show a profit in the working of the farm.

42,691. Does the produce of the school plots go to the pupils, or is it sold?—This is the weak point of the system. We are considering the question, but at present the profits of the boys' hard-earned labour go to the Treasury. We should evolve a system whereby the profits are linked up with the work. The boys would learn arithmetic very much better if they had to make up their own accounts. The Education Department is quite satisfied if a boy does four sums right out of six, but if we kept our private accounts on that system we should soon be bankrupt. I should like to link up the financial arrangements of these plots very much more with the actual work. We are now considering this question in conjunction with the Finance Department. One of the main features of Moga is that the boys have an active financial interest in the plots. Moga is fortunate in that respect because it is a non-Government agency, but we hope to evolve a system by which something similar to that may be introduced; it is essential. The same applies not only to agriculture but also to activities such as rope-making and basket-making.

42,692. You have given a very clear opinion against the vocational training of boys below the age of 17?—In separate institutions, yes.

42,693. We find these separate institutions cost anything from Rs.370 to Rs.560 per pupil per year?—They are much more expensive and I also feel that vocational training should be based on a sound and reasonable measure of general training. That is the main feature of our system. It is better that agriculture should form an integral part of the ordinary vernacular system.

42,694. I should like to have one thing cleared up. How far does the attempt to introduce agriculture into middle schools fit in with the knowledge of the boy's father? Do you teach these boys some things their fathers do not know or only up to the limit of what their fathers know?—A boy is taught certain things which his father does not know. The farms have a very large number of visitors, which indicates that the fathers find something to learn there.

42,695. There is always a danger that if you teach the boys less than the father knows the father may be contemptuous of the school?—That is so.

**Mr. Sanderson*: There are examples where the parents have come to laugh at the school when it started and after a period of three years they have come again to ask for advice on various matters.

The Witness: We have also encouraged certain crops such as vegetables which have been taken up by the farmers in the neighbourhood of the schools.

42,696. In the middle schools where you have this agricultural section, is there any difficulty about the teacher undertaking manual work?—No. The teacher has had a year's training at Lyallpur where he does a great deal of manual labour.

42,697. I once asked a Director of Public Instruction whether he had ever seen a teacher weeding his school garden, and he replied that not only had he never seen that, but he had never seen a teacher who had a garden of his own?—I can assure you that not only agricultural teachers, but all the ordinary vernacular teachers weed and do work with their own hands.

42,698. On the question of rural science, we have been told that Indians generally are so little interested in nature that they apparently do not know what happens to caterpillars. Do you think that applies to the Punjab?—No, I do not think so; certainly not, I hope, to the rising generation who are receiving the training which I have tried to describe. They ought to know about caterpillars.

42,699. To what extent is English competing with agriculture?—Seriously. We have specimen time-tables here which indicate that if a school takes English, then the time that can be devoted to agriculture and so forth is seriously reduced. It is even more serious than that. If you once introduce optional English, you very often find a different type of master as head of the school. We have tried to counteract this tendency by loading the dice in favour of the agriculturist; and I am glad to say that there are quite a number of masters who have been trained at Lyallpur and have now risen to the posts of headmasters of vernacular middle schools.

42,700. Does this agricultural section of the middle school serve as an obstacle to the boy wishing to proceed to the high school?—To some extent, but not entirely. We hope that in the course of time, people will appreciate the vernacular system on its merits, but there is a serious drift to the Anglo-vernacular side.

42,701. Do you charge any fees in your middle schools?—Yes, but not particularly for agriculture.

* Mr. Sanderson, Inspector of Training Institutions, Punjab, was present with Sir George Anderson.

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42,702. I ask that because some of these special vocational schools are made free at an enormous cost. Is there any resentment felt against compulsion being introduced?—No.

42,703. Are not fines inflicted at all?—They have been levied to a limited extent, but more in towns than in the rural areas.

42,704. We are told that in Baroda where there is compulsory education there has been practically no effect on literacy?—That is an unfortunate experiment.

42,705. Do you think that compulsory education is achieving the end it aims at?—Yes, though not very rapidly, of course. After all, it takes time.

42,706. Other Directors of Public Instruction have been rather astounded when I asked them whether they co-operated with the Co-operative Department at all. Have you found co-ordination with the Co-operative Department of any value?—Of very distinct value to the Education Department. I have already indicated that the Co-operative Department has done valuable work in the matter of compulsion, and it has also co-operated with us very energetically in our system of training in vernacular schools, where co-operative officials give lectures and in which they take a general interest They have given us great assistance in one form or other not only in vernacular schools but in training institutions also. Then we are organising what we call a refresher course for a number of village teachers in the next month. The Co-operative Department has promised to send one of their men to lecture and to interest the teachers in co-operative work. The Co-operative Department has been most generous in its assistance.

42,707. Have you been co-operating freely with the Department of Public Health?—Yes.

42,708. The Chairman asked you about the cost of primary education. I think the information wanted was the total cost to the parent of sending his boy to school for four years, the cost of school-books, slates and things like that?—It is very difficult to say.

42,709. In some Provinces we have been told that although the education itself is free the cost of providing school readers, pencils and so on is quite a serious item?—I do not think it amounts to more than four or five rupees.

42,710. Does the lack of education of females detract seriously from this movement for literacy amongst males?—Yes, certainly.

42,711. The practical test is not completed when you have got a certain percentage of boys attending the school?—I think that the slow development of education amongst girls is a most serious factor in the situation.

42,712. I think you stated somewhere, in one of your articles, that it is hopeless in this country to look to the female teacher as an economically cheaper means of male education?—You mean that we cannot employ her?

42,712A. Yes; you cannot get female teachers as you do in America or in England. I think you pointed out that practically in no country in the world have you got general compulsory free education without the female teacher?—Exactly; that is a most serious defect in the system of Indian education. I suppose that about 80 per cent. of the teachers in primary schools in the west are women; there are none in this country; it is a very serious factor. At present we are getting a sufficient number of men recruits to our vernacular training institutions, but the time may come when this source will not be sufficient.

42,713. We have heard complaints in other Provinces that the educational system is top-heavy, that too much money and attention are being devoted to the high school and college education and too little to village education. Do you think that that applies to the Punjab?—No. I notice that our expenditure on vernacular education has gone up now to over

60 lakhs out of a budget of 150 lakhs, and if we reach 80 per cent. of the boys of the school-going age, we should want about 30 to 40 lakhs more of recurring expenditure.

42,714. About 90 lakhs altogether?—Yes, to accommodate 80 per cent. of the boys of school-going age; that is not inclusive of capital charges, for buildings, &c., and it also does not include the girls.

42,715. So that there is something in the statement?—Yes.

42,716. I presume you know that book, "England's Green and Pleasant Land," where a doleful picture is drawn of the country-side and it is mentioned that the sole hope is the teacher? Do you think the teachers are, or are likely to become, the centres of village life?—I think it is more essential in India than in other countries. The Indian country-side lacks educated men, notably the parson, the doctor and the educated squire. Therefore, it is of the greatest importance that the village teacher should take a prominent part in the general progress of Indian villages. We are trying to equip him for this task by the improved methods of training which I tried to describe.

42,717. Practically the sole hope in India is the teacher?—I would not go so far as that; surely the co-operative movement would play a great part.

42,718. *Professor Gangulee*: What is the average salary you give to the village schoolmaster?—The junior vernacular teacher starts at about Rs.25 and may end as a senior vernacular teacher at about Rs.75. But there are other allowances to help him. If he takes the adult school, he draws Rs.72 a year; if he is a librarian, he draws another Rs.40 or Rs.50. Others get postal allowances when they do postal work.

42,719. You must raise his economic status in order that the villagers may appreciate him?—Yes. I agree that he ought to get more. We have recently raised the pay of the village teachers very considerably. I understand that in other Provinces there are different systems. I am told that sometimes the teacher gets only Rs.3 or Rs.4. Our system is more favourable to the teacher.

42,720. *Mr. Calvert*: We have heard a great deal of this drift of educated people to the towns. It has been explained in various ways, even that education is responsible for it, and witnesses have gone so far as to suggest that we should not attempt to educate the villager beyond the primary stage as more education makes him useless for agricultural work. Could you give us your opinion as to why in a country like the Punjab it is so? Is it the dullness of the village life?—Certainly, and this we are trying to counteract by the village library and still more by the village playing ground. There is the glamour of Government service and the general idea that if a boy becomes a matriculate the whole world is at his feet.

42,721. In spite of the talk of the dignity of labour, Government service is naturally more attractive?—Yes. (*Mr. Sanderson*): The chief difficulty, I understand, is the economic factor; you cannot pay your farm labourer enough.

42,722. Would you acquit the teacher entirely?—No; I think that in the past the teacher has been much to blame. I still admit it, but I hope that we are training up a more suitable type of teacher. In general, matriculates are not suitable. It is much better to give preference to those who have taken the vernacular course, and especially to those who have taken agriculture. Such preference would counteract that very dangerous tendency to which you have referred.

42,723. You think you can safely carry on the expansion of village education up to the end of the middle stage without necessarily urbanising the

pupil?—If you keep out optional English, the whole atmosphere and training will be changed.

42,724. But is it not a world-wide problem? We get the same complaint in England and elsewhere. The reason must be something of a general nature. After all, the Indian village is duller than the English village, but still you get an exactly similar drift in England. Do you think there is any psychological effect in the education which makes the people dislike manual labour?—I think, undoubtedly, if it is imparted on urban lines; the mere fact that a teacher thinks it is beneath his dignity to weed proves it; but I am sure, at any rate, that our teachers weed.

42,725. *Mr. Kamat*: About this question of urban drift, from your experience do you really think that the *Babu* who wants to go to the towns is fond of entering Government service merely for the sake of the service or because he cannot get any other decent occupation in rural parts?—It is very largely the glamour of Government service.

42,726. If the *Babu* can get in the village even three-fourths of what he gets in the Government service in cities, do you think he would really care to go to the town?—I think he would.

42,727. You, yourself, said that your school teachers did not dislike manual labour, they were prepared even to weed in their school gardens; so, inherently, they do not dislike work in the fields?—They have been given the opportunity and they respond to that opportunity; therefore I hope that the same will apply to the pupils.

42,728. The point is, if they can make a decent living out of agricultural holdings in villages, would they care to cross the threshhold of a Government office merely for the love of it? In other words, is it an economical question or a psychological question? If you trace the real cause of the urban drift, it is because agriculture does not pay and does not hold out any prospects to the man who wants to make an independent living?—That may be the case.

42,729. So, unless those two problems are considered side by side, no conclusions could be come to?—Yes; that is right.

42,730. To refer once again to those small caterpillars, I know you could claim very many good things in the Punjab, but do you also claim that the school teacher of your Province knows everything about caterpillars and Nature, whereas if you cross to the next Province, the United Provinces, he does not know anything about Nature?—I do not claim that every teacher in the Punjab knows everything, but I think every teacher of the future would know about caterpillars.

42,731. On page 346, I am very glad to see that you are more optimistic than Mr. Richey himself in your estimate of the time within which there will spread universal primary education in your Province. Do you estimate that at least 80 per cent. of the boys of school-going age will be under primary education in about six years' time?—Yes, provided that the average rate of expansion is maintained.

42,732. Is this due to the very rapid awakening in recent years in regard to the need for mass education, or is it due to the new policy introduced since 1921 of speeding up primary education by the Ministry of Education?—For both reasons. There is undoubtedly an awakening of the masses; there is undoubtedly a very great keenness for education so far as the Ministry of Education is concerned, and, as I have indicated, it has received very considerable additions of money.

42,733. So you attribute it to both?—Yes.

42,734. In other words, it is one of the effects of the new atmosphere since the Reforms?—I was not in the Province in the pre-Reform days, and

so cannot offer an opinion. Mr. Sanderson has just remarked that educational advance in this Province has received a very great impetus from the soldiers who came back in large numbers from the War. That is a contributory factor also.

42,735. At any rate, this is a distinctly healthy outlook which goes to show that many of the difficulties which were apprehended by the Government of India some fifteen years ago, when the late Mr. Gokhale introduced a Bill in this connection, have not in actual practice been realised, difficulties with regard to funds, school buildings, and so on?—The financial position may have altered since then, but we have not experienced serious difficulties up till now.

42,736. You say that, almost automatically, within six years 80 per cent. of the boys will come under elementary education. If you are of that opinion, then I should like to know where is the necessity of introducing compulsion?—I tried to explain to the Chairman that the main object of compulsion is to prolong the period of school-going age. I agree with Mr. Calvert in thinking that it is a waste of time and money for a boy to come to school only for a year or two, because that would not be of much benefit. We therefore regard compulsion rather as a guarantee that the large sums of money spent on vernacular education shall be spent to the best purpose, with a consequential reduction of illiteracy.

42,737. *Mr. Calvert*: Compulsion is aimed at more at the fourth class rather than at the lower classes?—Yes, that is the point.

42,738. *Mr. Kamat*: I dare say you must have calculated your figures in this note very carefully, but I should like to satisfy myself that there is no flaw, and it is with that object that I wish to ask you one or two questions. You have included 85,000 adult pupils in this figure of total enrolment?—Yes.

42,739. And your percentage of 8·44 of boys under education to the total male population includes that?—That is right.

42,740. May I also know whether in this enrolment of 1,062,816 there are also girls?—Yes.

42,741. I want to know if that does not introduce a flaw?—I have added one year to my calculation to provide for the adults.

42,742. The percentage is based on the ratio of the total enrolment to the total male population; the total enrolment includes girls and also adults; and when you estimate six years, you take the basis of the percentage of boys only?—The enrolment figures include boys and girls, but the percentage figures are for boys only.

42,743. That does not affect the point. The point is if ·75 as the rise is correct. The factor which vitiates, I think, the whole of your calculation is the total enrolment in which in one case you include girls and adults but not in another.

42,744. *Mr. Calvert*: This percentage refers to boys only, and that is the percentage you are working on?—Yes; the percentage figures at the bottom of page 345 are, as I have said, for boys.

42,745. *Mr. Kamat*: Quite so. Let me put it in another form. Your total male population is thirteen millions, out of which you claim the present enrolment of 1,062,816, which works out to 8·44?—No.

42,746. In this enrolment of 1,062,816 you said you had included girls, and therefore your percentage of 8·44 is thoroughly vitiated if you are finding out in how many years boys will come under elementary education?—No, this is the percentage of boys to the male population.

42,747. Quite so: this percentage of 8·44 would have been perfectly correct, taking the whole male population to be 13 millions, if your figure of 1,062,816 had comprised boys only, which, however, you say is not the case. I hope you follow me now. Will you look up that point?—I have looked it up.

42,748. *Professor Gangulee*: This percentage of 8·44 is not based on the enrolment figures?—No.

42,749. *Mr. Kamat*: At all events, we shall have to look into the figures more carefully to see if six years is a correct estimate.

I have one more question to ask you about your system. In paragraph 5, on page 346, you say that the rapid expansion has been due in the main to the policy of the Punjab Government, which aims at encouragement in the rural areas of two things, one of which is, you say, the organisation of grants-in-aid for vernacular education in the Province. You assess grants to Local Boards not by a flat rate but a differential rate?—Yes.

42,750. That is to say, in the case of the wealthy District Boards you give up to 50 per cent. and in the case of poor Districts Boards you give up to 90 per cent.? That has a great deal to do with your expansion?—It has assisted in expansion in what were known hitherto as backward areas.

42,751. *Mr. Roberts*: On page 245 of the Punjab Government's memorandum (paragraph 14) you emphasise the importance of a sound system of rural education, and this is a point which was touched on by Mr. Calvert. If we are to get agricultural improvement you regard this as the vital point in your development here?—Certainly.

42,752. Do you find that a certain amount of missionary work is necessary to carry on this programme?—Yes, if you mean missionary work in the wider sense.

42,753. You must get this not only from yourselves but from the men who are responsible for looking after these schools?—Yes.

42,754. Are these vernacular teachers possessed of any experience before they go to Lyallpur?—The teachers are selected from among those who possess the School Leaving certificate. We give preference to agriculturists and to those who have a bent for this form of work.

42,755. I notice that since 1923, owing to the financial stringency, you have gone in for school gardens. Have you any views on the point as to whether school gardens are preferable to school farms?—We introduced a system of gardens merely on account of the financial stringency; I should certainly put the farm ahead of the garden, but a garden often develops into a farm. A garden is beneficial to the extent that it enables us to test whether the people are keen and whether the place is suitable. When we have gained some indication that the garden has been successful, then we can convert it into a farm.

42,756. There is no question of principle involved?—No, it was mainly on financial grounds.

42,757. With regard to the development of higher education in agriculture, would you favour a scheme of doing the early part of the agricultural degree in intermediate colleges, such as the arts or science colleges?—No, I think that the scope of an arts college is to provide a suitable basis of general training; and that the purely professional work should be done at an agricultural college. Therefore, *vice versa*, I consider it wrong that an agricultural college should spend much time and labour in teaching general subjects to boys, subjects such as English, mathematics, and so forth. In other words, the function of the intermediate or arts college is to give that general training which would enable an agricultural college to devote all

its energies to the professional side. It seems to me wrong that a boy at Lyallpur should fail, after four years, in his final examination in a subject such as English or mathematics, which subjects he should have grasped before he was admitted to Lyallpur. That seems to me the defect in the present system, and therefore in answer to your main question I would say that the function of the intermediate college is to devote all its time to giving that general education which is regarded by the authorities at Lyallpur to be suitable. On the other hand I am very much in favour of the idea that in high schools or intermediate colleges there should be a school farm, work on which should be regarded as being outside the time-table. The subject of agriculture would therefore be equivalent to hockey or volley ball and not to mathematics.

42,758. Do you think the best line of development is to extend Lyallpur and take a very much larger number of students, or do you think it is possible to do part of the early training in some other college?—If Lyallpur began after the intermediate stage, by which time the general education should have been completed, then there would be much room at Lyallpur for expansion in consequence of the elimination of the intermediate classes; then of course the course in agriculture will be one of three years.

42,759. You see no objection in principle to doing the intermediate education elsewhere if it is properly done?—I think the general education in pure science, English and mathematics could be done profitably elsewhere.

42,760. If you had a sound general education up to the intermediate stage elsewhere, you see no reason why the Lyallpur course should not be used for completing the three years' course?—I see every reason why it should be.

42,761. *Sir Henry Lawrence*: In table III A of your report*, pages X and XI, the total expenditure on education is given as 123 lakhs. Do you regard the expenditure on different sections of education as well balanced? Are you satisfied that the expenditure on Universities and higher education bears a proper proportion to that of high schools, middle schools and primary schools?—Before I answer that question, I take it that you are aware that the terminology is different in this Province from that used in Bombay; in Bombay you class as primary our vernacular middle schools. In answer to your question, a greater proportion of the total amount should be given to vernacular education.

42,762. Out of these 123 lakhs, 62 lakhs is spent on middle, vernacular and primary schools?—Yes.

42,763. That was the figure you were referring to just now?—Yes, that is the figure; I think I said 60 lakhs.

42,764. On the whole you are satisfied, but you would like to see a larger proportion of the total spent on vernacular and primary schools?—I would rather put it in another way. If we have fresh funds placed at our disposal, those funds should be given in the main to vernacular education.

42,765. This figure of 62 lakhs *prima facie* is somewhat small compared with the expenditure in some other Provinces on vernacular, is it not?—I should think it is; it is rather low in proportion.

42,766. *Sir Ganga Ram*: When you speak of vernacular schools, do you mean Urdu?—A vernacular school is a school in which the medium of instruction is Urdu and in which only vernacular subjects are taught, except for the unfortunate optional English in a certain number of schools.

42,767. *Sir Henry Lawrence*: Is it your view that if any portion of the expenditure is disproportionate, it is that portion which is spent on high schools which amounts to 49 lakhs?—Yes, and that spent on University education.

42,768. On page *XV the total expenditure is 231 lakhs?—Yes.

* Report on the Progress of Education in the Punjab for 1925-26.

42,769. That includes buildings, I understand?—That is the total cost; the expenditure on buildings is shown there as 37 lakhs.

42,770. I do not quite follow these figures. The 123 lakhs is the ordinary recurring expenditure including municipal funds, fees and everything?—Yes; fees amount to 50 lakhs.

42,771. On page XI, out of the expenditure on professional colleges that on agriculture is only Rs.1,08,000 out of a total on Universities and colleges of 34 lakhs?—That, I take it, is the cost of the Agricultural College at Lyallpur which comes under another department.

42,772. That is to say, 3 per cent. of the expenditure on professional colleges and Universities is expended on agriculture?—On the Agricultural college, yes.

42,773. In your opinion, is that a sufficient proportion?—I am not responsible for the collegiate education in agriculture. Speaking generally, it seems to me to be rather a small amount. These figures are merely incorporated in my report, and are provided by other departments.

42,774. On page XIX there is a grand total; of which the expenditure on female education is 25 lakhs, while that on male education is 231 lakhs; that is to say your total expenditure on female education is about 10 per cent. of your total education?—Yes.

42,775. Would you like to see that increased?—We are increasing very materially the amounts spent on schools for girls in large towns, but we find it very difficult to extend education for girls in rural areas, not so much on financial as on other grounds.

42,776. Do you think the salaries given to women teachers are sufficient?—In towns, yes, in comparison with men. In rural areas it is not so much the pay which counts; it is the lack of accommodation and the lack of life in a village. If we doubled the pay I do not suppose it would induce women teachers to go to the villages.

42,777. Could you give any idea of what the scale of salaries for women teachers is?—You mean village teachers?

42,778. In both cases?—In Anglo-vernacular schools in the Subordinate Service the pay goes up to Rs.200. Then there are a certain number of posts in the Provincial Service. On the whole, lady teachers in the town schools receive higher remuneration in accordance with their qualifications than the men.

42,779. What are the lower grades paid?—In village schools they are paid about Rs.20 or Rs.30.

42,780. Considering the difficulties they have to face in finding accommodation and in getting suitable companionship, do you think the salaries are sufficient?—No.

42,781. You have mentioned the very great difficulties they experience in establishing a home in the village?—Yes.

42,782. Should not their difficulties in that respect be recognised by Government so as to give them a scale of pay quite out of proportion to that of men to enable them to establish a reasonable home in a village? On a salary of Rs.20 no woman can go to a village and take a companion or two to live with her, which is almost a necessary precaution for her protection?—Exactly.

42,783. Ought not that to be recognised in their scale of salaries if you are going to make a real advance in rural education?—It should be recognised. You speak of one or two companions; if one could only find a nucleus for a school large enough to warrant the employment of three or four teachers, then the position would be very different. What we are

trying to do now is to mark down some twenty or thirty places in rural areas in the Punjab where we could institute Government vernacular middle schools, that is to say, schools with 150 pupils and with five or six teachers; that would make all the difference. In this respect, though it is not altogether applicable to your question, I should like to urge that the Missions have done very good work in the education of girls in this Province in rural areas. The Missions, with their Mission centres, have very much better opportunities of success than Government. We are trying to encourage the Missions to develop more in the direction of the vernacular middle schools.

42,784. I only suggest for your consideration that as long as your expenditure is limited to 10 per cent. of the expenditure on men, there is room for improvement, to put it mildly?—Yes, and, as a matter of fact, we have a large item for girls' education in our schedules which are now before the Council.

42,785. On page 22 of this same Report, paragraph 9, you refer to the necessity of having a constant and contented staff of Inspectors and teachers. Do you think you have got that?—Yes, to a large extent. This paragraph was written with reference to an agitation for a time-scale in the Subordinate Service. We have not given a time-scale, but at the same time we have redistributed the numbers in each of the grades. The bottom grades were rather top-heavy, with the result that the poor people in the bottom grades, when they got to the top of the grade, were blocked for some considerable time.

42,786. In the highest grades, have you got a contented staff of superior officers? Inspectors and so forth?—I should say so; they are a most enthusiastic body of men and do extremely good work.

42,787. With the increasing responsibilities of your department, have you got a sufficient cadre of European officers?—No, the numbers of our European officers are very small. They have dwindled very considerably in recent years; we have suffered because of the hiatus between the Report of the Lee Commission and the substitution of an equivalent to the old Indian educational system.

42,788. Are you recruiting any more European officers?—We are still in that awkward state of transition; until the equivalent has been arranged, it is difficult to recruit European officers.

42,789. What are the numbers of your European staff compared with, say, ten years ago?—Speaking at random, less than half, I should think.

42,790. What are the figures roughly? Is it a reduction from 25 to 10?—I could let you have the exact figures, but I think it is about 20 to 10.

42,791. Do you regard a certain proportion of European staff as desirable?—Yes.

42,792. And essential?—Yes, I think so. After all, we are presenting Western learning to an Eastern race, and therefore it is necessary to have a certain number of Europeans. For the last four or five years we have had two European and three Indian Inspectors; I consider that to be a sound proportion which should be maintained.

42,793. I see from an interesting table in this Report that the different communities have been progressing at somewhat different speeds; the number of Mahommedans who have come up in the last five years has increased 100 per cent. while Sikhs and other Hindus have increased 50 per cent.?—Yes, that is largely due to the fact that Mahommedans have shown considerable enthusiasm for education, and also because they had more leeway to make up than the others.

42,794. They are just making up leeway, are they?—Yes, very fast.

42,795. Is the present proportion of each community about level now?—About level, but not in the higher stages; the Mahommedans have not yet got up to the higher stages in sufficiently large numbers.

42,796. Is there any communal difficulty inside the Educational Department? Do you regard the presence of Europeans as in any way to be based on these communal jealousies?—Such difficulty is usually thrust in from outside.

42,797. But on the broader ground of presenting Western education to an Eastern race?—Yes; I do not think there is much communal jealousy within the department, but I would suggest that a great deal is thrust into it from outside. The number of communal questions asked in Council with reference to education, I think, is most unfortunate.

42,798. What is your view of the application of compulsion in order to keep a boy at school? I should like to know quite how your legislation has been framed to enable you to do that?—We can inflict fines, if we like.

42,799. The method of applying this compulsion is entirely at the option of the inspecting officer; is that your view?—Yes, to a large extent.

42,800. I understand the terms of the law provide that compulsion should be applied to all boys; you modify that so far as to apply the compulsion to parents who have once sent their boys to school?—In the main, yes; though at times, of course, we have inflicted fines on parents for not sending their boys to school.

42,801. *Mr. Calvert*: How do you notify an area?—The parents apply to the District Board; the District Board sends that application by rather a circuitous route to the Ministry of Education through the Deputy Commissioner and the Commissioner.

42,802. The initiative rests with the District Board?—The initiative really rests with the parents, but in accordance with the law, the initiative is with the District Board.

42,803. *Sir Henry Lawrence*: You speak of the new primers that are being or have been prepared; is it a matter of difficulty to secure the use of a better class of primers, or is that left to the option of the District Boards?—The use of primers would depend very largely on the teachers concerned, acting under the direction and supervision of the Inspector.

42,804. You do not prescribe any particular primer for universal use?—Yes, we have what we call a Text Book Committee which assists the department in prescribing books.

42,805. Do they merely recognise certain primers from which some other persons make their selection?—Yes, that is the system; we put on our list primers which may be used.

42,806. If you wish to introduce revised primers with a greater agricultural bias, have you any difficulty in doing so?—No, I do not think we should have any difficulty, except, of course, the present difficulty, that the existing teachers would not understand them. Therefore, we are delaying the preparation of these primers and the revision of the courses until such time as we have trained up a number of teachers who will understand them and who will have been trained in accordance with the spirit of this work. These teachers are now being trained.

42,807. *Professor Gangulee*: There primers are prepared at the direction of the department?—We have not reached the stage of revising the primers for the reason I have given. We have delayed revising the primers until the teachers have been trained. Probably, we shall arrange for the writing of these primers and certainly for the revision.

42,808. *Sir Henry Lawrence*: You are not faced with the difficulty which you may remember arose in Bombay owing to the competition of different authors of rival books?—Yes, we are certainly faced with these difficulties. I calculate that in English books alone for matriculation the boys of this Province pay over 5 lakhs in three years; we reduced that sum very much the other day when we regulated the prices of these books.

42,809. Have you any section of the population in the Punjab who, even with the existing insufficient supply of primary schools, are, in fact, able to educate 100 per cent. of their boys? You may remember that in Bombay there is a section of gentlemen who are very much interested in primary education, the Brahmins of the Deccan?—Yes.

42,810. You may remember that they are able to educate 100 per cent. of their school-going boys? Have you any corresponding section of the population here in the Punjab?—No, I should say not.

42,811. I am referring primarily to the enthusiasm of a section of the population for education which enables them, by making use of such facilities as are available, to educate every single boy in that community; a Brahmin in the area of which I have spoken will send a boy twenty miles and make arrangements for him to live with a friend in order to get educated? —No, I should not think we have anything like that.

42,812. *Mr. Calvert*: There is the small Parsee community?—Yes, but that is negligible in numbers.

42,813. *Sir Ganga Ram*: Do the figures you have given as to the progress in education made by Mahommedans and Hindus relate only to Government schools or to all schools unaided as well as aided?—To all schools.

42,814. Have you got your revised text books complete now in the vernacular?—No, we are waiting until the teachers are ready; we hope to begin the work of revision in a year or so.

42,815. How far do these text books go in the matter of science and technical terms?—The Text Book Committee worked out an index of technical terms; whether or not it has been of very much use, I cannot say.

42,816. Have you been able to find terms in the vernacular corresponding to the technical terms used in the higher sciences?—I do not know.

42,817. Are you still using English terms or do you find suitable terms in the vernacular?—The Text Book Committee has tried to find suitable terms in the vernacular; with what success I cannot tell you.

42,818. How do they translate the word "harrow" and "disc" plough? —I am told it is translated by the same word.

42,819. You said just now that the medium of instruction in Punjab Government schools is Urdu?—Yes.

42,820. Do you give grants to private schools in which the medium is the vernacular?—There are no private vernacular schools.

42,821. But if they sprung up, would you deny them grants simply because the medium of education was the vernacular?—I should like to have notice of that question.

42,822. You know for admission into the Medical College the University lays down certain courses, for instance the First Arts. Supposing the same method were adopted for admitting the boys into the Agricultural College, thus reducing the period to be undergone in the Agricultural College to three or four years or even less, would you support the idea?—I am in favour of the general course preceding the professional course in agriculture being conducted in an arts college.

42,823. Have you any objection to introducing agriculture as an optional subject in the B.A. class on a par with zoology or botany?—I have great objection.

42,824. Will you move it in the University?—We have raised strong objections before the University and we noticed with sorrow the absence of Sir Ganga Ram to support us.

42,825. You once told me that the boys going to rural schools forget everything after two or three years?—There is a serious relapse into illiteracy.

42,826. To what extent?—I am unable to state the exact extent.

42,827. What is your view on the general statement that boys going to the school get a dislike for the plough?—Granted the opportunity boys can be encouraged to plough.

42,828. I think, whether in lieu of village gardens or in addition to them, teachers should have a walk in the fields and teach the boys nature study?—That is what we are trying to do.

42,829. Have you started that?—Certainly.

42,830. *Sir Thomas Middleton*: You give on page 347 a comparison of the pupils in the middle schools. I understand that the middle school in the Punjab means a school having at least six classes?—Yes.

42,831. Does it mean the same thing in other Provinces?—No, it does not; it is for that reason that I did not give the figures for Madras and Bombay. We hold that a primary pupil in a middle school should get on far better than a primary pupil in a primary school.

42,832. So that these figures are for primary pupils in middle schools?— Yes.

42,833. You have explained the working of compulsion, but I am still in some difficulty about your paradox that compulsion in India can only prosper if it is voluntary. By that you mean it must be voluntary in the community but compulsory on the individual?—Yes.

42,834. Now the community voluntarily accepts compulsion as a principle; how does it act in the case of the individual afterwards?—It is compulsory for the individual.

42,835. How is attendance enforced?—In accordance with the Act.

42,836. You have no attendance officer?—The village schoolmaster usually acts as secretary to the attendance committee and he would perform the duties of an attendance officer in a village.

42,837. So that it is his business to go and hunt for the boys?—Yes.

42,838. Is it done by moral pressure and not by fine?—(*Mr. Sanderson*): Largely by moral pressure. We have 101 boys in a school attending out of a total of 105; that is by moral pressure only. (*Sir George Anderson*): Moral pressure and legitimate bribery; that is, if a community desires to have a lower middle school, we quite legitimately say to them "you will not have this lower middle school until you apply compulsion." If the Government gives a lower middle school, it should have some guarantee that it serves some good purpose.

42,839. *Sir Henry Lawrence*: By what authorities are the fines imposed? The attendance committee. Each school area has an attendance committee, in accordance with the byelaws.

42,840. The parents are taken before the magistrate?—Yes.

42,841. Who has the power to impose the fine, the committee or the magistrate?—The magistrate.

42,842. At the instance of the committee?—Yes.

42,843. *Sir Thomas Middleton*: Does the schoolmaster, in his capacity of attendance master, get a percentage of the fine?—No.

42,844. In the case of these middle schools teaching agriculture, do you prescribe the number of hours per week to be given to practical instruction and to theoretical instruction, or is that left to the District Board to prescribe?—We prescribe the period to be devoted to agriculture; but it varies between those schools which have optional English and those schools which do not have optional English. In the purely vernacular school it works out at six hours in the eighth and seventh classes, four hours in the sixth and fifth classes, and so on.

42,845. You lay down the minimum number of hours which a schoolmaster should give to the subjects?—Yes, and it varies in accordance with whether they have optional English or not; but, of course, the boys are also expected to do work out of school hours.

42,846. They do the practical work out of school hours?—They do practical work also in the school hours. We have no menials on these farms except a man to look after the bullocks.

42,847. I think you said that the boys do not participate at all in the produce; the money goes direct to the Treasury?—Yes, unfortunately.

42,848. That is a subject you are reconsidering?—Yes, in consultation with the Finance Department.

42,849. You have referred to the great importance of the schoolmaster in the village. Have you any definite evidence that since you started these agricultural teachers they are taking a lead in agricultural matters in the villages in which they are working?—Yes, we have it.

42,850. So they are increasing in value not only as teachers in schools but as leaders of the community?—Yes. This is the "Summary of Effects of School Agricultural Farms as Subsidiary Demonstration Farms."* It is stated therein "At Kalanaur (Gurdaspur District), Patti (Lahore District) and Ajnala (Amristar District) the seed of vegetables grown on the school-farm is highly appreciated by the local growers, being considered superior in quality to that available in the market. At Baddowal, Ludhiana district, the experiments with the growing of potatoes, garlic, cauliflower and a few other paying crops has been so successful that a few of the zamindars in the village have begun to grow these crops for the first time in the history of that village and sufficient profits have accrued to them."

42,851. These specially trained schoolmasters are, in effect, propagandist officers for the Agricultural Department?—Yes, for all departments.

42,852. I am interested in your method of giving grants in the Punjab. The rich board gets 50 per cent., the poor board gets up to 90 per cent. Can you secure any agreement as to which boards are rich and which are poor?—We take into account the needs of each district. We receive a good deal of information from the Local Self-Government Department. It is not difficult to know that Lyallpur is a rich district. In some other countries I know it to be difficult to convince the local people that their district is rich.

42,853. You have not met with any serious administrative difficulty, I take it, in this system of distributing grants?—No, except, of course, that people like to make themselves appear poorer than they are.

42,854. On the question of literacy, you take 80 per cent. as the figure you are going to secure? Is the other 20 per cent. written off as a general factor of safety in your estimate, or have you in mind the difficulty of making education compulsory in nomadic tribes?—Yes.

* Report on the Progress of Education in the Punjab for 1925-26.

42,855. Have you to deal with a considerable nomadic population?—I think there is a large proportion of nomadic people.

42,855A. They are a considerable proportion in the Punjab?—Mr. Calvert might know.

Mr. Calvert: Not much.

42,856. *Sir Thomas Middleton*: Such people have proved a difficulty in the case of districts in other parts of India which have adopted compulsory education?—The difficulty is not due mainly to that consideration; but there is the difficulty of the scattered population. It is scarcely worth while having a school merely for seven pupils.

42,857. I take it that it is not a serious problem here?—No.

42,858. Are there many scholarships available from your high schools for students proceeding to the colleges?—Yes.

42,859. What would it cost a parent to maintain his son at one of your arts colleges or professional colleges for, say, four years?—I know nothing about professional colleges, but with regard to arts colleges you have raised a very difficult question. I am told that at a Government college the rate of living is rising very rapidly and is about Rs.80 or Rs.90 a month all told, but a rather higher standard of living is adopted in Lahore than elsewhere.

42,860. Can you tell me whether the cost is much less in any other part of the Province?—Yes, we calculate that in our intermediate colleges the cost would be very much less. Of course these figures of Rs.80 or Rs.90 which I have given are the maximum.

42,861. But if you take the scholarship of the boy into account, then the cost would be less?—Yes, the scholarship would be Rs.20 in which case it would cost about Rs.70.

42,862. Have you no intermediate science colleges?—Science is taught in the intermediate colleges.

42,863. I was thinking of the question which Mr. Roberts put to you, namely, the possibility of teaching elementary science in the intermediate college?—Yes, pure science is taught in all the intermediate colleges.

42,864. Assuming that the pupil can take physics, chemistry and botany in an intermediate college, would there be any difficulty in passing him on to Lyallpur for the purely professional part?—That is exactly what I should suggest.

42,865. You mentioned the desirability of the high school having a farm, but your reference led me to suppose that you will have no examination subject in agriculture at a high school?—The examination kills the subject.

42,866. *Mr. Calvert*: The subject of agriculture?—Yes. I understand that you are going with Sir Ganga Ram shortly to Renala; if you have the time you might see the agricultural farm attached to the school there. We are trying the experiment there of attaching a farm to a high school in a rural area in which the boy is expected to farm for enjoyment's sake and not for an examination..

42,867. I understand then that at the present time agriculture is an optional subject in the matriculation examinations?—Yes.

42,868. Do many students take it?—There are a very large number who do.

42,869. As an easy option?—Yes.

42,870. *Mr. Barron*: I should like to clear up just one point. It was pointed out just now that the expenditure on a professional college for agriculture is Rs.1,08,000; the figure appears on page 11 of the Appendices

of last year's Education Department's Report. You have got that figure I suppose from the Agricultural Department?—Yes.

42,871. It refers to the Agricultural College at Lyallpur?—Yes.

42,872. But at the Agricultural College a great deal of research work is done in addition to teaching as well, is it not?—Yes.

42,873. Because in the Budget figures I find that in the estimate for 1925-26 to which this figure relates, the amount budgeted for the college is Rs.1,63,108 and for the Research Institute Rs.1,82,216, making a total expenditure on the college of Rs.3,45,000 odd?—Yes.

42,874. There is also a separate entry for Agricultural Engineering and for the college farm?—Yes, it is not incorporated in the figures supplied to us.

42,875. This is an estimate of the probable expenditure on the mere teaching done at the Agricultural College?—That is the case.

42,876. It is not really possible, probably, to make anything more than a rough estimate of the amount spent on teaching and the amount spent on the other activities?—Yes.

42,877. This figure is really not worth very much?—No.

42,878. *Professor Gangulee*: How many schools in rural areas have developed into community centres so that the people of a particular village have taken an interest in the school, by utilising it, and so on?—That is a difficult question to answer, but our aim is that every school should become the centre.

42,879. Do the co-operative or agricultural officers make the schools a centre for propaganda?—Yes, as I have said a very large number of co-operative societies, and so forth, have been started, and we hope that every department will make use of our libraries.

42,880. Are these school farms supervised by the Department of Agriculture?—No; they are supervised by Mr. Lachman Das, who is on the cadre of the Education Department, but whose headquarters are at the Agricultural College at Lyallpur.

42,881. So that the Department of Agriculture has nothing to do with these farms?—I would not say that.

42,882. At any rate, do you get much assistance from the Department of Agriculture in carrying on the school farms?—Yes, we do. Where the Agricultural Department comes in is in the training of the agricultural teachers which is done at Lyallpur.

42,883. But the actual farm operations are carried out independently of the Agricultural Department?—By the Education Department with the co-operation of the Agricultural Department.

42,884. Are the women teachers chiefly recruited from the Christian community?—Not chiefly.

(The witness withdrew.)

Mr. UJJAL SINGH, M.A., M.L.C., Lahore.

Replies to the Questionnaire.

Question 3.—Demonstration and Propaganda.—(*a*) Cultivation in the Punjab has for ages been carried on by old methods, without effecting the slightest improvement. The reasons have been, (1) that agriculture was not until a few years ago considered a science requiring research work; (2) the cultivation of land was considered to be an occupation of the illiterate; (3) the cultivator by instinct is a conservative and is averse to

Sir George Anderson.

any innovations in the methods of cultivations; (4) the commercial aspect of land cultivation was not realised.

Hence the cultivator only produced for the satisfaction of his wants, and not for the accumulation of wealth. The chief factors that produced a new angle of vision in agriculture were, (1) the opening of the canal colonies; (2) rise in the price of produce; (3) introduction of American cotton and other paying crops in the canal colonies; (4) the consequent rise in the price of land; (5) the establishment of the Department of Agriculture, and (6) the co-operative movement.

Influenced by these factors the cultivator became more rational, more industrious in his work. Of all the measures, by the introduction of American cotton and afterwards the work of seed selection and distribution of the same to the cultivator, the Agricultural Department has rendered service of signal importance which has set the cultivator seriously thinking whether he can materially add to his income by judicious cultivation.

(*b*) and (*c*) Demonstration farms worked departmentally have their uses as places in which new experiments can be made, but otherwise they have not been the cause of influencing the methods of cultivation. Demonstration and propaganda carried out on selected cultivators' fields prove more effective in bringing home to the cultivator the soundness of modern methods. In my opinion the number of Agricultural Assistants should be largely increased. Groups of villages should be formed and for every group those cultivators should be selected who are prepared to carry on their operations strictly according to the instructions of the agricultural experts. Demonstrations should then be carried on in those fields. Amongst other qualifications the fact that a cultivator has carried on his agricultural operations according to the advice of the agricultural experts should carry weight in giving appointments as *lambardaris* or other posts of influence, and in granting *sanads* or rewards.

The Punjab Government is proposing to open up demonstration farms in every district. In my opinion these farms should not be run departmentally. In order to create an incentive for young men who want to make agriculture their profession, the farms should be leased out for a number of years (say three) to graduates of the Agriculture College. Every year about eight or ten such graduates should be given opportunity to take up these farms. The size of the farms should not be less than 125 acres. This scheme has the following advantages:—

(1) It will give a raw graduate an opportunity of practical training and of management, and will equip him for managing larger farms.

(2) From the profits of the farm he will have the necessary capital which is essential in taking larger areas on lease from private persons.

(3) He will attract the attention of cultivators more than an official is expected to do, and will thus be able to influence them and induce them to accept expert advice;

(4) Agriculture will cease to be a profession of the illiterates. Agricultural education will be keenly sought after and in a number of years we shall see graduates of the Agricultural College spreading out into the country, competing with one another, paying higher rents, ousting the lazy and indolent cultivators from the land. By their skill and trained intelligence they will be able to produce more from the land and thus add to the wealth of the Province. The above scheme is likely to be successful for propaganda and demonstration. But, for carrying on experiments with new and better kinds of crops and for seed selection, two or three bigger farms are necessary, and these the Government should run departmentally.

QUESTION (7).—FRAGMENTATION OF HOLDINGS.—The Indian law provides equal sub-divisions of holdings between all the sons of a cultivator, with the result that fragmentation is carried on to a fraction of an acre. This process has produced a class of peasant proprietors. But at the same time, quite a large number of holdings have become so small that they have ceased to be economical. Small holdings, up to a certain limit, are an incentive to intensive cultivation as the cultivator has to put forth all his energy and intelligence to make his living. But when a holding is so small that, however industrious and intelligent a cultivator may be, it is not possible for him to make both ends meet, it becomes an evil. The cultivator does not work as he knows he cannot make a living on it and the love of land does not allow him to part with it and make a living by some other work. The result is that either the cultivator starves or, if he is very enterprising, he leaves the holdings uncultivated and finds work outside. In order to check this evil some sort of legislation is necessary, by which sub-divisions of holdings beyond ten or twelve acres may be stopped. For consolidation of small holdings the formation of societies for that purpose should be encouraged and facilities should be provided for exchange of such holdings. I think this work should also form part of the activities of the co-operative societies.

QUESTION 8.—IRRIGATION.—For equitable distribution of canal water it is necessary that the irrigation division at the tail should be provided with extra water to make up for any shortage of supply at the tail on account of canal closures and occasional breaches. On the Lower Bari Doab Canal it is a patent fact that zamindars in the "Okara" division, which is near the head, always get a better supply than those of the Khanewal division which is at the tail. Any repairs being made throughout the length of the canal, or any breach, tells upon the tail. At the time of closures upper divisions head up water with the result that the tail division again suffers. For making up these occasional, but almost perennial losses, the supply to the tail portion should be made proportionately higher.

The most serious defect in the existing supply of canal water is almost the negation of water at the tails of minors. Some of the minors are 20 miles long and some of the distributaries are about 80 miles in length. This is so very defective that any trouble anywhere along the length of such minors and distributaries curtails the supply at the tail. I have experience of one minor known as "Tumanwala," which takes off from 12 distributary. This minor is about 20 miles in length and moreover passes through *kallar* lands. Since the canal was dug, the village at the tail of the minor has never received a proper supply. The cultivators are practically ruined. They are, almost without exception, heavily indebted. Sometimes there is a breach, another time some village outlet above the tail is tampered with, but the village at the tail has never seen a single good harvest. On the incessant petitions of the cultivators, a scheme of a shorter minor for four villages near the tail was proposed, but it was dropped though the villagers were prepared to pay the entire cost of the new minor. Another proposal was made for curtailing the length of the minor; that too was dropped. What I mean to say is that minors and distributaries are too long for any water to reach the tail. It should be made a rule that a minor should not be longer than eight miles, or near about, and a distributary about 15 to 20 miles. Immediate and radical measures are necessary to save the villagers at the tails of minors from bankruptcy. Connected with the same problem is the problem of the form of outlet suitable for equitable distribution of water. Wooden shoots are no good. Masonry outlets of the Crump type, though quite suitable, are generally tampered with by the zamindars. K.G. outlets or iron pipes are the best, under the circumstances, and give a proper supply with which no zamindar can tamper.

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QUESTION 9.—SOILS.—(ii) *Reclamation of alkali and bara lands.*—A considerable portion of land in the Lower Bari Doab Colony consists of inferior land of which what is known as "*bara*" is the worst type. To avoid such a considerable loss of revenue the Government decided to start an experimental farm on typical bad land, in 1918, to find out successful methods of reclamation. In 1922, on my application, Government granted me an area of such inferior land so that I might attempt to improve the same by methods the expenses of which did not run beyond the means of an average cultivator. According to the soil survey of the Colony Department the land is described as *bara*. It is highly arid, very closely packed and intractable, and is highly charged with alkali salts. Water does not penetrate for a considerable number of days, and after the water dries up it breakes up into hexagonal clods and becomes so hard that it does not allow the plant to grow. The soil was analysed by the Agricultural Chemist of the Agricultural College, Lyallpur. The mechanical analysis shows that the proportion of coarse sand is much less in *bara* soil than is the case in normal soil. The chemical analysis shows the existence of alkali salts in large quantities in the *bara* soil. The texture of the soil is so bad that ploughing is difficult. When water is given, at places the land remains very wet in parts, and at other places becomes too dry. It forms a bad seed bed. In order to improve the soil, the first thing necessary is deep ploughing and the addition of ordinary coarse sand. This method has proved fairly successful in improving the texture of the soil. For deep ploughing on such hard soil I am using Fowler's steam tackle. The addition of sand makes a good upper surface. It helps the plant to grow much better than it does ordinarily on such soils. Once any crop begins to grow to some size, by ploughing the same in the soil green manuring is possible. I have done it on extensive scale, and found the results very encouraging. Special crops such as sugar cane, *sawak*, rice, *juar*, *bajra*, those that have extensive root system, have been found to grow well and have helped considerably in improving the soil. Three varieties of sugar cane were tried by me. *Suretha*, ordinary *katha*, and Coimbatore 205. Of these three, Coimbatore 205 has beaten others in quality as well as in yield. Addition of farmyard manure improves the land considerably. The best and the cheapest results are obtained where sand and farmyard manure are added to the soil. Then, with intelligent cultivation and excessive watering, fairly good crops are possible. For removing alkaline salts excessive watering is necessary, as the salts settle down. Gypsum has been found useful in neutralising salts, but it is more costly than the addition of sand and farmyard manure. Five plots of four *kanals* each were treated by me, one with 50 maunds and 12 cartloads of farmyard manure, a second plot with 100 maunds gypsum alone, a third plot with 25 cartloads of farmyard manure alone, a fourth plot with 2,500 cubic feet of sand, and the fifth plot was the ordinary *bara* soil without any previous treatment. Wheat was sown in all these plots. The results were as below:—

			Yield.	
			Maunds.	*Seers.*
Plot 1.	Gypsum and farmyard manure ...	4 kanals	1	38
,, 2.	,, alone	,,	1	20
,, 3.	Farmyard manure alone	,,	1	5
,, 4.	Sand alone	,,	1	18
,, 5.	Untreated plot	,,	0	15

Gypsum was bought from the Government *bara* farm at Kahuta at Rs.1 per maund in powdered condition. I am trying *sajji* in the soil, which is a plant that grows in *kallar* soil, and the idea is that it draws

alkaline salts from the soil. I have grown many acres, but its effects on the soil have to be watched.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*a*) The number of days' work done by a cultivator differs in different parts of the country. In canal irrigated areas the number is considerably higher than in non-irrigated areas. In the former case an average cultivator works for about 180 to 200 days on his field and in the latter case the number does not exceed 100 days.

In the slack season there is nothing to occupy a cultivator except carrying goods for others on hire by bullock cart. Most of the time is spent in litigation, in the tracking of thieves who are clever in cattle lifting, or, if it is a canal irrigated area, in running after the canal and civil officers for one affair or another. A cultivator by instinct has a contempt for industries so he never tries to add to his income by occupying his spare time in poultry rearing or other small industries.

(*b*) and (*c*) There is a strange inherent feeling in the minds of cultivators that industrial occupation is degrading. The caste system is to some extent responsible for the existence of this invidious distinction. Even vegetable growing is considered below the dignity of a Jat. Poultry, fruit and vegetable growing can flourish successfully in areas which are within five miles' radius of a town. The Government is already encouraging fruit growing and it should be further encouraged in the way of facilities of water supply and expert advice which should be readily available. Poultry-keeping is a very paying industry if properly managed. If the Government only reserves a small area in villages near a town for encouraging cultivators to adopt this industry, successful results are likely to be achieved.

(*d*) Much requires to be done by the State in the matter of encouraging oil pressing, sugar making, &c. The Punjab is rich in raw produce, but the bulk of the produce is exported and imported again in the form of refined oil, soap, paper, &c. The fact that over one hundred thousand tons of cotton seed are exported annually shows the scope of the industry. Some plants for pressing cotton seed were set up, but were closed down mainly for lack of means of disposal of the oil cake. Similarly the Punjab produces good sugar cane, but there are very few successful sugar factories. State help is urgently needed to make these industries connected with agriculture a success.

The cotton ginning industry does not require State help, but it is necessary for Government to keep a careful watch over this industry so that the quality of cotton may improve. Government has already passed the Cotton Ginning and Pressing Factories Act, which will have a whole-some influence. Some have sugested licensing of cotton ginning factories. But this would be considered an interference in trade. For the present the Government should have a control over the number of ginning factories required for each *mandi*. No new factories should be allowed to be built without the Government being satisfied that there is actual need of a factory there. Small factories that spring up are the cause of bad ginning and other malpractices.

Oral Evidence.

42,885. *The Chairman*: Mr. Ujjal Singh, you are a Member of the Legislative Council?—Yes.

42,886. You have favoured us with a note of the evidence which you wish to put before the Royal Commission. Do you desire at this stage to make any statement in addition to that which you have given us, or may we ask you one or two questions?—I have nothing further to say.

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42,887. I gather from your note, which I have read with interest, that you are of opinion that the activities of the Agricultural Department have succeeded in awakening in the cultivator's mind the idea that there is some prospect of improving the methods of agriculture practised by his forefathers?—To that extent, yes.

42,888. There is a growing demand for the services of the Department?—Not to that extent; I should only say that in the matter of seed selection and seed distribution the Agricultural Department has rendered good service, and there is undoubtedly a great demand for seed from the Agricultural Department.

42,889. On page 373 of your note you make a suggestion that the demonstration farms to be opened by Government should be leased out for a number of years to graduates of the Agricultural College. Is there any guarantee that these graduates would make a success of these farms as centres of demonstration?—Those farms would be run under the instruction of the Agricultural Department, and the Agricultural Department would make a selection of those graduates who are likely to make them a success. If the experiment was tried, I think it would prove a great incentive to the graduates of the Agricultural College not to take to Government service, but to take to farming as a business. As a matter of fact, up to the present very few graduates have taken to farming as a business; the graduates of the Agricultural College have almost all of them gone into Government service, and even the diploma-holders, those who have taken the two-years' course, prefer service, say, at Rs.70 or Rs.80 rather than taking about ten or twelve squares of land on lease.

42,890. What extent of control by the Department of Agriculture over the croppings and size of these farms would you suggest?—I think liberty of action should be given to these graduates for the management of the farms; the Agricultural Department should simply watch their operations and see whether they are carrying on their work properly.

42,891. They should leave these graduates to manage the farm?—Yes.

42,892. On page 374 of your note you give us some views with regard to fragmentation of holdings, and you suggest that the moment has come when steps might be taken in order to check this growing evil. Do you think public opinion would look with favour on legislation designed to that end?—I am not very sanguine about it, but I think it is a step in the right direction. At any rate, public opinion should be educated towards it.

42,893. You are not yourself confident that the moment has come for such legislation?—Not at present.

42,894. Do you think that a prudent beginning in that connection might be to coerce a small minority who resist schemes for consolidation?—Yes; unless some pressure is brought on these people by legislation of some sort, it is not possible to consolidate small holdings.

42,895. Do you think that the small cultivator has any appreciation of the extent to which serious fragmentation reduces his opportunities of making money?—At present there is a good deal of ignorance amongst the cultivators, but I think the cultivators are beginning to feel that this fragmentation is causing them great loss.

42,896. On the same page in answer to our Question 8 on Irrigation, you deal with the difficulty that is met with by cultivators at the tail of the system. Is this a growing difficulty or has it always existed?—It is a growing difficulty. On the canal that I have experience of, the Lower Bari Doab canal and on the main canal, the division at the tail suffered; the same is the case on the distributaries and on the minors. As a matter of fact, there is not a proper system of supply at the tail.

42,897. But have things got worse in recent years?—No, I would not say they have become worse, but they have not improved; that much I am prepared to say.

42,898. You give a very interesting note, on page 375 in answer to our Question 9, of your experience in reclaiming certain lands. Has that venture paid?—It is not a paying concern yet; but I hope it will pay in the long run.

42,899. How many years ago was it that you first reclaimed?—It is the seventh crop.

42,900. *Mr. Barron*: That would be 3½ years?—Yes.

42,901. *The Chairman*: And it is not paying you yet?—No. I started first with just a small area; out of that I have reclaimed about 20 or 25 squares; that is about 625 acres; that land is paying me to the extent of about Rs.300 per square, but I am spending money on the reclamation of the remaining area.

42,902. It looks as though you may be making a profit on the area you first reclaimed and reinvesting it in reclaiming more land; is that the position?—That is not exactly it; the area which I first reclaimed is giving me a little income, but I am investing more money to reclaim further areas.

42,903. You use steam power to break up the land?—Yes.

42,904. Do you continue cultivating by the same means or do you adopt bullock cultivation once you have broken up the land?—No, it is just the same system of cultivation; I plough with steam tackle, but the land I have reclaimed I have given over to the tenants on the *batai* system.

42,905. And they are using bullock cultivation?—They are using bullock cultivation, but I supplement their methods by the steam tackle: I give them one ploughing, and I charge about Rs.3 per acre.

42,906. You give them one deep ploughing a year?—Yes, one deep ploughing with the steam tackle each year after one crop. Supposing they raise a cotton crop now, after the cotton is harvested, I give them one ploughing to break up the land, and I charge Rs.3 per acre for that.

42,907. To what depth are you ploughing?—Six to eight inches.

42,908. Are there indications that the saline condition of the land that you reclaimed three years ago is improving?—It is improving, but the trouble is that it depends upon good cultivation; one portion which was cultivated by a very bad cultivator has lapsed into bad ground again, but if the area is cultivated by a good cultivator it goes on improving.

42,909. Is that land commanded by a canal?—Yes. The trouble with this land is that unless it is properly cultivated and very carefully cultivated it goes back.

42,910. And becomes as hard as ever?—Yes.

42,911. Are there traces that this particular tract of land has ever been cultivated before?—No, it has never been cultivated before.

42,912. How long does the effect of the gypsum last? Have you been able to check that?—No, I have not been able to check that.

42,913. Does the sand tend to go down and disappear or does it remain on the surface?—It remains on the surface.

42,914. Do you notice any diminution in the disinclination of the Jat cultivator to undertake secondary industrial occupations such as fruit-farming, chicken-farming and so on?—Certainly that disinclination is decreasing now to an appreciable extent.

42,915. You say poultry is a very paying industry if properly managed; what leads you to take that view?—Because where the market towns are springing up there is a great demand for eggs, table poultry and so on.

42,916. That demand is not being entirely satisfied at the moment?—It is not being entirely satisfied; as a matter of fact, in some small towns eggs are dearer than they are in Lahore.

42,917. Have you studied the technical side of the poultry industry at all?—No.

42,918. What view do you take on the question of the burning of cowdung? Is it doing a great deal of harm to the land?—It is certainly doing great harm, but I think the cultivators are now realising the loss they sustain by burning this cowdung; they realise that if put on the soil it will increase considerably the yield of the crop.

42,919. How do you account for the growing knowledge of the cultivator in that respect?—Take sugarcane, for example. Every cultivator finds that unless he uses farmyard manure he cannot get a good crop. That is the case with all the more highly-paying crops.

42,920. The introduction of such crops has educated the cultivator?—Yes.

42,921. Do you find people make arrangements with various villagers to buy from them the cowdung produced by their cattle? Can you buy cowdung in a village?—In one village where I have land, I have bought cowdung from two cultivators, because their land was exceedingly good and they did not require it. In the ordinary way every zamindar would require his cowdung for his own land.

42,922. You could not purchase at economic prices any surplus cowdung in an ordinary village?—No.

42,923. Are you making any compost?—What I am doing is to dig pits in which I place all the rubbish of the village. After five or six months I put it on to the fields.

42,924. Is that proving quite successful?—Very successful.

42,925. How many pairs of working bullocks do you keep for your land?—Generally two pairs for one square of 25 acres.

42,926. How much land do you farm yourself by direct farming?—On this particularly bad land, I do direct farming to the extent of about 70 squares, or 1,700 acres.

42,927. How many pairs of bullocks do you keep for that area?—At present I have 40 pairs.

42,928. *Mr. Roberts*: Assisted by steam?—Yes.

42,929. *The Chairman*: Do you have any difficulty in providing these working bullocks with sufficient and good enough fodder all through the year?—No. At present I grow sufficient fodder for my bullocks for all the year.

42,930. Is there no season for shortage?—I do not feel it now.

42,931. Do you preserve any fodder?—No, we do not preserve any fodder, but we have *bhusa*.

42,932. Have you attempted to make any silage at all?—No.

42,933. Do you keep any milch cows?—Yes.

42,934. Have you any difficulty in providing them with proper food all through the year?—There is not much difficulty in providing food. I have lately started sheep farming there for manuring. I have about 200 sheep there at present, but later on I am going to keep about 1,000 sheep just to help me in providing manure.

42,935. Do you fold them on the land and move them about?—No. I have reserved four or five squares for the purpose, because it is bad land. In this land I have grown *sajji* and *kikar* trees which provide them with food.

42,936. You enclose the sheep in a particular square and leave them there until they have eaten the whole of the crop?—No, there are those four or five squares, and then there is some waste land there on which the sheep can feed. There is difficulty with regard to fodder at present, but as soon as fodder is available I mean to extend the system.

42,937. Do these sheep pay?—At present I only want manure, and I let the man who feeds them take the wool and so on.

42,938. *Sir Henry Lawrence*: In regard to poultry farming, is there any prejudice amongst certain sections of the population against eating eggs?—I do not think that is the case in the Punjab.

42,939. Do all Sikhs eat eggs?—Yes, they do.

42,940. You are a Sikh?—Yes.

42,941. And even all Hindus?—There may be some who have some religious prejudice, but the Sikhs are permitted to eat eggs according to their faith.

42,942. And do the Brahmins eat eggs too? Some do not, but some of them do.

42,943. You think that there is no strong objection to this industry in the Punjab?—No, I do not think so.

42,944. Is the eating of poultry also universal?—Yes, except with a certain class of Brahmins; otherwise it is universal.

42,945. There are, therefore, good prospects for the development of the poultry industry throughout the country?—Yes.

42,946. *Sir Thomas Middleton*: You keep two pairs of bullocks on each square of land. Are these actually employed for more than half the year?—On canal irrigated lands it would come to about half the year.

42,947. In the half year when they are working, how much grain do you give them every day?—It all depends on the capacity of the cultivator.

42,948. What do you yourself give?—We generally allow about three seers for one pair.

42,949. During the time when the work is light, do they get any grain at all?—No, then they graze in the fields and also get dry *bhusa*.

42,950. Do you give your cows grain after calving?—No, not after calving.

42,951. What I mean is this. When the cow is in full milk, how much grain do you allow her?—Roughly two seers.

42,952. And then you expect how much milk from her?—A good cow ought to yield about 8 to 10 seers.

42,953. And you give only two seers of grain?—But besides that they also get *toria* cake with *bhusa* and green fodder.

42,954. How much cake do you give in addition?—About two seers of cake per day.

42,955. When the cow is dry for two or three months before she calves, do you give her any grain or cake?—When the cow is dry, generally we give her cake with *bhusa*, but no grain.

42,956. How much cake do you give?—About two or three seers.

42,956A. What kind of cake do you use?—*Toria* seed cake.

42,957. *Mr. Calvert*: *Toria* is a rape seed?—Yes.

42,958. *Sir Thomas Middleton*: You suggest that these demonstration farms run by Government should be given over to young graduates. Do you not think it requires a good deal of experience to run a demonstration

farm?—I think demonstration farms are useful in order to induce agriculturists to adopt improved methods, and the graduates have certainly some knowledge of agriculture and ought to be able to run these farms.

42,959. But they are only beginners when they came out of a college, and you cannot expect them the first year after leaving Lyallpur to run a demonstration farm by themselves?—I think they ought to be able to do so. As a matter of fact, even now there are some farms which are run by Agricultural College people who have not much experience.

42,960. But those farms are duly supervised?—Even in those cases, I would suggest that the farms should be supervised by the Agricultural Department.

42,961. You mean that they would merely have charge of the labour, and that all the general arrangements would be made by the department?—Not the general arrangements. The farms would be run generally by the graduates, but the Agricultural Department would watch their activities and see that they were carrying out their work properly.

42,962. How long have you yourself been farming?—Since I left college.

42,963. Do you think you could have provided a good demonstration in the first two or three years after you left the college?—I was never a student of the Agricultural College.

42,964. *Mr. Barron*: Your original home is in the Shahpur District and you own lands on the lower Bari Doab canal?—Yes, I bought the land in auction there and then set up a ginning factory.

42,965. You got a lease of this bad land in April, 1923?—Yes.

42,966. It is 2,524 acres, is it not?—Yes.

42,967. When did you begin cultivating it?—My first crop was the *kharif* crop of 1924.

42,968. Was there a condition in your lease that for the first four harvests you should pay no land revenue or water-rate?—Yes.

42,969. And for the fifth to eighth harvest you pay quarter to half rates?—Yes.

42,970. At the end of five years you have the option of purchase?—Yes.

42,971. At what price?—Rs.25 per acre.

42,972. That is the original value of the land before you reclaimed it?—Yes.

42,973. It would be far less than the value of the land after you have had it for five years?—I do not know what the cost of the improvements would come to, but I think it will be less.

42,974. Anyhow, you are satisfied with the terms of your lease?—Yes.

42,975. During the course of your work, have you applied to the Agricultural Department for assistance and advice from time to time?—Yes.

42,976. And have you always got that advice and assistance?—Yes.

42,977. I am only asking this question because a witness yesterday declared that he could not get any advice from the Agricultural Department. Whenever you have applied for any advice, you have invariably got it?—Certainly.

42,978. Do you regard it as good advice? Were the results good?—The Deputy Director has been watching all the operations I have been carrying on, and I took this idea of gypsum from the Agricultural Department. The Deputy Director of Agriculture was very much struck with the idea of putting on sand for the improvement of the soil.

42,979. You have got no grievance against the department, have you?—I have not got any particular grievance. The only thing that I wanted to point out was that the Agricultural Department ought to help the cultivators more on the field than they are doing at present.

42,980. That is perhaps a question of how many Agricultural Assistants and other staff generally there are in the department?—I do not know. The staff ought to be increased; that is my opinion.

42,981. *Sir Thomas Middleton*: How much sand do you put on per acre?—About 5,000 cubic feet per acre.

42,982. It must be very expensive?—We generally have sandy *tibbas*, heaps of sand, within a radius of a mile, and we can get it. Generally in the winter the Pathans come and their labour is cheap.

42,983. What will you have to pay for labour per head?—I pay by contract; I generally pay from Rs.7 to Rs.12 per 1,000 cubic feet. It depends on the distance.

42,984. *Sir Henry Lawrence*: How far do you carry the sand?—Up to half a mile.

42,984A. On donkeys?—Yes.

42,985. *Sir James MacKenna*: You are an M.A. of the Punjab University?—Yes.

42,986. In what subject?—History.

42,987. What induced you to take up agriculture?—I had land already, so I was specially interested in it.

42,988. You were stimulated by the attempts of other gentlemen to reclaim these waste areas?—No; I tried it myself. Government was running an experimental *bara* reclamation farm. I saw that before taking up this land, and I was tempted to try it too, and I also wanted to interest myself in agriculture.

42,989. What did the steam tackle cost you?—Rs.62,000; that is the K type.

42,990. What does it cost you per acre?—Rs.3-8-0 to Rs.4.

42,991. Mr. Fowler sent you men to instal it?—Yes.

42,992. You told the Chairman that you keep a couple of hundred sheep. Why do you keep them? For wool?—For the purpose of manure only.

42,993. *Professor Gangulee*: How many acres have you already reclaimed?—About 600 acres.

42,994. Would you tell the Commission your cost of reclamation per acre?—I cannot exactly tell you because the area that I am reclaiming is scattered about in different places. I cannot say now that such and such an area has been reclaimed at such a cost till the whole area is reclaimed. But till now the whole thing has cost me about Rs.3,08,000.

42,995. You have irrigation facilities there?—Yes.

42,996. Do you find the application of gypsum very useful?—I do not find it very useful; I find it useful to some extent; it is very costly.

42,997. Does your soil contain more sodium chloride than sodium carbonate?—Yes.

42,998. So, by irrigation you would get good results?—Yes, by flooding I am able to get better results.

42,999. *Mr. Calvert*: Do you think that a law which prohibited sub-division below half a square would be welcome?—I think it would be welcome because the cultivators feel that a further sub-division takes away much of the profit of their labour.

Mr. Ujjal Singh.

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43,000. Having got down to a stage where a man who owns half a square has two sons, could you limit inheritance to one son only?—Obviously that has to be done; otherwise the sub-division would go on.

43,001. Do you think it could be done without creating any resentment?—I think so.

43,002. Are you a Khatri?—Yes.

43,003. What are your tenants?—They are Marghi Sikhs and Arains.

43,004. Have you any Khatri tenants?—No.

43,005. *Mr. Kamat*: As a practical farmer what is your experience of agricultural graduates?—I have not got any experience of them. Only those belonging to the Agricultural Department come and visit my farm; that is all the experience I have.

43,006. Have you tried to attract middle class youth to farming, the same as you do? Have you made any definite attempt to interest them?—Of course, in one way I have done so. I had got one or two men in my service. I gave them two or three squares and made them work there. They have taken so much interest that at present they have taken 60 or 70 squares on lease and are working them.

43,007. So that the middle class youth can make money if his interest is aroused?—Certainly.

43,008. You have tried it and found it successful?—Certainly.

43,009. They do not run away to cities?—There is one trouble; in cities they have more comforts and the village life is not so attractive as the town life; there is trouble in that way. But if the village life becomes more attractive, then I think the middle class youth will remain in the village.

43,010. You say on the last page that much requires to be done by the State in the matter of encouraging oil pressing, sugar-making and cotton-seed utilisation. You have here a Director of Industries, I suppose?—Yes.

43,011. Have you consulted him about oil pressing?—I have consulted him and I have also got one or two oil presses; but because the oil refining requires a lot of capital, unless the Government sets a plant for oil refining it is difficult for people to take it up.

43,012. What was the general attitude of the Director of Industries in giving you help or advice?—His attitude has been very sympathetic.

43,013. About sugar refining, have you made any attempt in that direction in moving Government?—No, I have not.

43,014. As a Member of the Council, have you ascertained what their attitude is?—We have had no opportunity of ascertaining their views.

43,015. *Mr. Roberts*: Do you agree that it will be a good thing to attract more capital to agriculture?—Certainly, it will be a good thing.

43,016. In your case you are spending a good deal more money than the ordinary man could afford, are you not?—Certainly.

43,017. I believe you are a member of the Irrigation Advisory Committee in your district?—Yes.

43,018. And you are in close touch with public opinion? You are the Vice-President of the Notified Area Committee?—Yes.

43,019. Speaking generally, do you consider that the policy of remodelling the outlets starting from the tail up towards the canal head is sound, or would you prefer to have it started from the head?—I think it will be better if they remodel from the head downwards.

43,020. With regard to the farms you recommend for the agricultural graduates, I think you will admit that Rs.500 or Rs.600 a square would be a moderate rent for canal lands?—Yes, for good lands.

43,021. So these five squares would return Rs.2,500 or Rs.3,000 per annum?—Yes.

43,022. It would be equivalent to nearly Rs.250 a month?—Yes.

43,023. From that point of view do you not think it is a very expensive method of subsidising?—I do not think so, because if the Government were to run these demonstration farms departmentally, the Government would not get any profit out of them, but if a graduate were to run these farms, he would be able to make a profit.

43,024. Why do you think the Government will not get a profit?—Because the man in charge will get so much and there are other supervising and other charges to be met. I do not know whether the farms are profitable. The experimental farms ought certainly to be run by the Government, not demonstration farms.

43,025. You use departmental seed for wheat and so on?—Yes.

43,026. I think you take a good deal of interest in recommending these seeds to the people round about you?—Yes.

43,027. You supply cotton seeds from your factories and you help generally?—Yes.

(The witness withdrew.)

Mr. SHIV DEV SINGH, Honorary Magistrate, Siranwali (District Sialkot).

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION.—(i) Yes, the supply of teachers and institutions is sufficient.

(ii) There is urgent need for extension of teaching facilities in Sialkot District.

(iii) Yes, the teachers in rural areas should be drawn from the agricultural classes.

(v) Mostly Government service is the main incentive which induces boys to study agriculture.

(vi) Yes, the agricultural classes mainly supply the pupils.

(viii) Nature study, school plots and school farms are useful.

(ix) Most of the students enter Government service.

(x) (i.) By making agriculture more productive and more remunerative.

(xi) None.

(xii) The most powerful means are literature, the press, and the touring lectures. In the Punjab, as elsewhere in India, the masses are generally illiterate, so that the first essential for the success of any scheme should be the removal of illiteracy. As soon as this is accomplished, the village libraries and the press will be taken advantage of. So long as illiteracy continues, touring lecturers are the only means of adult education available. No non-official agency exists for this purpose, but various departments of Government, such as Agriculture, Co-operation, Veterinary and Public Health are doing something. The cinema and the magic lantern will also be useful.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(a) There exists a demonstration farm run by Agricultural Department at the headquarters of this district. This farm has influenced the practice of agriculture to

some extent. An important move in this direction has recently been made by the Co-operative Department who have organised better farming societies wherein members are pledged to follow the methods of agriculture recommended by officers of Department of Agriculture. These societies will lead to the imitation of improved methods by the neighbouring cultivators.

(*b*) The best and the cheapest means seem to be the organisation of more societies of the type described above. The Agricultural Department should help them by their advice. There should also be one demonstration farm run by Government at each convenient centre for about fifty villages.

(*c*) Expert advice will be adopted if the cultivator finds it really pays him to adopt it. There should be more demonstration farms and more touring instructors.

(*d*) I am not aware of any instance of failure. I know of one instance of success in this district. In response to a circular issued by the Director of Agriculture, some villages were selected for intensive propaganda jointly by the Agricultural Department and Co-operative Departments. In one of them, namely, at Fatehgarh, the success achieved has been wonderful. The village has now been organised into a co-operative better-farming society. The old *deshi* plough has been replaced by the Meston, while 90 per cent. of the area under cultivation is under improved varieties of wheat, cotton and sugarcane. The movement for better cultivation has spread to other villages in the neighbourhood also, where 50 to 90 per cent. of the area is being cultivated by improved methods.

QUESTION 5.—FINANCE.—(*a*) Co-operative credit is developing steadily in this district, and there seems no better way of financing agricultural operations for short periods. So far as long-term credit is concerned, mortgage banks on co-operative lines should be organised. The matter has been under discussion for some time past and I understand the Co-operative Department is taking steps to organise such banks.

(*b*) I think the Government system of *taccavi* loans is not very popular, and should be replaced by making such advances through co-operative credit societies which are now very numerous in this district.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) The main causes of borrowing are:—

1. Unremunerative holdings. The pressure of population has reduced the holdings to such a degree that most cultivators are running their farms almost at a loss. This necessitates borrowing and is tending to further aggravate the situation.
2. Thriftlessness of cultivators.
3. Heavy mortality among cattle.
4. The vicious system of moneylending as practised by the moneylenders.
5. Vicissitudes of nature, such as failure of rains, etc.
6. Litigation.
7. Extravagant ceremonial expenditure.

(ii) The sources of credit are:—

1. Co-operative credit societies.
2. Indigenous moneylending as practised by the moneylender.
3. Cattle dealers who give cattle on credit.
4. Petty shop-keepers who supply some articles on credit.

(iii) The reasons preventing repayment are:—

1. Failure of crops.
2. Low morale, due to poverty.
3. Facilities and extension allowed by moneylenders in order to retain custom.

(*b*) No special measures are desirable as they would lead to degeneration.
(*c*) Measures limiting the right of mortgage and sale should be adopted. Non-terminable mortgages should be prohibited.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) No means are possible at present.
(*b*) (i) Ignorance and mutual distrust among the people.
(ii) Lack of confidence in the Revenue staff.
(iii) Consolidation of holdings by the Co-operative Department is being successfully done in this district.
(*c*) Yes. Legislation is necessary.

QUESTION 8.—IRRIGATION.—(*a*) New irrigation schemes may be tried in Sialkot District.
(i) In perennial canals even, the supply is not regular. At certain periods the canal closes, even though the water is badly needed for certain crops in certain localities.
(iii) Facilities may be provided for water-lifting by means of improved water lifts.

QUESTION 10.—FERTILISERS.—(*a*) By increasing the number of cattle pastures, and by preserving the manure properly so that it is well rotted. Round about the Sialkot District there is scope for the application of *mohwa* cake.
In the case of fertilisers, facilities must be provided for preparing them in this country.

Lectures, propaganda, village libraries, demonstration plots run by the Agricultural Department in different places to show the practical utility of improved methods—all these are important.

Hedges should be planted all round the estate boundaries to serve as fencing and to produce wood for home consumption.

QUESTION 11.—CROPS.—(*a*) (i) Progress can be made by adopting improved methods of cultivation and improved seeds.
(ii) Yes, they should be introduced if properly proved on some experimental farm to suit a certain locality.
(iii) The distribution of improved seeds has already been taken up by the Agricultural Department, but more facilities are required.
(iv) Can be brought about by granting free licences to hunt.
(*b*) Not yet.
(*c*) The Agricultural Department is doing what is necessary.

QUESTION 12.—CULTIVATION.—(i) Yes. Just after harvesting the crop, the field must be ploughed up with a furrow-turning plough.
Definite rotations are very essential, keeping the following points in view:—
(i) Certain exhaustive crops should not be encouraged year after year.
(ii) Sowing of one crop year after year is to be avoided.
(iii) Facilities must be provided for every field to get manure at regular intervals.
(iv) Leguminous crops must be grown frequently in the rotation. There must be a suitable rotation for Sialkot district. I suggest wheat, maize, *senji*, sugarcane.
(v) None.
(vi) Growing of the more important crops in mixture should be avoided.

QUESTION 13.—CROP PROTECTION, INTERNAL AND EXTERNAL.—(i) I can only suggest that facilities may be provided for research on the pests and diseases affecting each crop.

QUESTION 14.—IMPLEMENTS.—(*a*) I have nothing to suggest.
(*b*) Education, propaganda, distribution of leaflets, making demonstrations in the villages and arranging cultural plots, improved implements. Above all, facilities must be provided for the local manufacture of implements. This work is entrusted to the Agricultural Department. The Department must have a workshop for manufacturing these implements.
(*c*) Shortage of stocks. The only remedy to meet these difficulties is that this work should be taken up by the Agricultural Department as mentioned above.

QUESTION 15.—VETERINARY.—(*a*) The Civil Veterinary Department should be independent.
(*b*) (i) Dispensaries are under the District Board. This system does not work well.
(ii) The needs for expansion are not adequately met.
(iii) The control should be transferred to provincial authorities.
(*c*) (i) Agriculturists do not make full use of Veterinary dispensaries. This is mainly due to ignorance and prejudice. The remedy is education.
(ii) There are no touring dispensaries in this district.
(*d*) Inoculation is popular in this district, but the hospitals cannot supply serum in sufficient quantity. Legislation dealing with contagious diseases would be unpopular. Education and propaganda are required.
(*e*) Very often sufficient serum is not available.
(*f*) Preventive inoculation is popular. No fees are charged.
(*g*) Further facilities for research on animal diseases are desirable. A provincial veterinary research institution should be established.
(*h*) Special investigations should be conducted by research officers in the Province.
(*i*) No superior officer is needed.

QUESTION 16.—ANIMAL HUSBANDRY.—(*b*) Over-stocking of common pastures causes injury to the cattle.
(ii) Absence of enclosed pastures does not produce much effect.
(iii) Dry fodder is sometimes insufficient; this leads to injury of cattle.
(iv) Absence of green fodder in the dry season is also another cause of injury.
(*c*) The fodder shortage is worst in November, December and January.
(*d*) No special method.
(*e*) The remedy lies in more education.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*a*) Every cultivator works for about 200 days in a year. He remains idle in slack season.
(*c*) Lack of education.
(*d*) Government should take the initiative.
(*f*) Yes.
(*h*) More education is the remedy.

QUESTION 18.—AGRICULTURAL LABOUR.—(*a*) No special measures are needed in the Punjab; the labour is sufficiently mobile.
(*b*) There is no shortage of agricultural labour in this province.
(*c*) No special measures are needed.

QUESTION 22.—CO-OPERATION.—(*a*) The progress of the co-operative movement is satisfactory. No special steps are needed.
(*c*) Special legislation is needed.
(*d*) Societies in this district are achieving their objects.

QUESTION 23.—GENERAL EDUCATION.—(*a*) Education should be given a rural bias.
(*b*) (i) Education in the rural areas should be such as to benefit the cultivator in his industry.
(iii) The reason is that education is not appreciated.

QUESTION 24.—ATTRACTING CAPITAL.—(*a*) Agriculture must be made more paying. This can be done by the introduction of improved technical methods.
(*b*) General ignorance.

QUESTION 25.—WELFARE OF THE RURAL POPULATION.—(*a*) Rural hygiene needs more attention. Government should construct a model village and induce people to construct their houses accordingly.

More education should be provided. Some measures should be taken to deal with village ponds and the manure heaps that are common sources of unhygienic conditions.

The social side of village life should be developed. In Europe the club system is very useful. These may be started and promoted in villages in the Punjab also.

(*b*) Economic surveys should be conducted. The Board of Economic Inquiry is doing useful work in this direction. Its functions should be enlarged.

Oral Evidence.

43,028. *The Chairman*: Mr. Shiv Dev Singh, you are an Honorary Magistrate of Siranwali in the District of Sialkot?—Yes.

43,029. You have provided us with a note of the evidence that you wish to give; may we ask you some questions on that, or are there any additions or corrections that you wish to make?—No.

43,030. I observe from your note that you attach importance to literature as a means of spreading information about improved agriculture?—Yes.

43,031. You rightly point out that illiteracy is a bar to the full usefulness of that means of disseminating information?—Certainly it is; it is at the bottom of everything; that bar should be removed.

43,032. Is it your experience that a few men who are literate in a village will read out literature provided to their neighbours who are not so fortunate?—Yes, there are very few people who are literate among the agricultural classes; it is difficult to adopt any improved methods unless that difficulty is removed; they stick to the old methods.

43,033. Perhaps they are right to stick to their old methods until they are certain that the new methods are better than the old?—Quite so.

43,034. Have you taken any active interest in the co-operative movement?—Yes, I am President of a Central Bank, but, as my *tehsil* is now attached to this part of the district, I shall relinquish that position.

43,035. Is the movement active and progressive in your District?—Yes, it is most satisfactory.

43,036. Have you reason to hope that it may extend to an important extent in the future?—Yes, I certainly do; there is great scope for its extension; it has done a lot of good to the agriculturists; it is the sole means of financing them.

43,037. But I see from your remarks on page 385 of your note that you are of the opinion that land mortgage banks should be organised for the provision of long term credit?—Yes.

43,038. Can you account at all for the fact that the Government system of *taccavi* is not very popular?—It is largely due to the delay in getting the *taccavi* through the *tehsil* staff; by the time they give the money it is no use; my idea is to give it through the co-operative societies.

43,039. To give *taccavi* loans through the Central Bonks?—Yes.

43,040. The Commission has been told that on the whole the co-operative credit societies have not had the effect of reducing the rate of interest

demanded by moneylenders; do you agree with that?—The moneylenders' profession has gone to a great extent; wealthy moneylenders are reduced to poverty.

43,041. Have they invested their capital to any extent in the co-operative movement?—Yes, they have; they know that the money is absolutely safe, and there is no trouble in getting it back as there is when they lend it to cultivators and have to go to a Civil Court. One big moneylender has invested nearly Rs.30,000 in the co-operative movement.

43,042. Are you a landholder yourself?—Yes, I am a landlord; I do not farm myself; I lease out the land to tenants; I supervise myself; I do not employ a middleman, and the tenants are contented and get a good margin of profit.

43,043. Have you any co-operative societies for better farming in your district?—Yes, I think there is one.

43,044. But you are not familiar with its working?—No, it is too far from where I am.

43,045. I see on page 387 that you hold that the Civil Veterinary Department should be independent of the Agricultural Department?—Yes.

43,046. What causes you to take that view?—I think it would be more satisfactory to place it in a separate department.

43,047. Are you not satisfied with the way in which the Civil Veterinary Department is being conducted at this moment?—No.

43,048. What complaints have you?—No special complaints, but I do not think it is working satisfactorily.

43,049. You say the system by which the veterinary dispensaries are under the District Boards is not working well?—No, I do not think it is.

43,050. What would you suggest as an alternative system of administration?—The department must be directly under the control of the Veterinary Department.

43,051. You would like to see them taken away from the District Boards?—Yes.

43,052. Would not that be something of a retrograde step? Is it not the policy of Government to encourage control by the local authority of these institutions?—Yes, perhaps to a certain extent that is so, but for the efficient working of the veterinary dispensaries I think it would be better to put them directly under the control of the Veterinary Department.

43,053. The demand for inoculation is increasing?—Yes, I think it is.

43,054. The prejudice is being removed?—Yes, but there is not enough serum.

43,055. Broadly speaking, what is the condition of the working cattle in your district?—Fairly good, I think.

43,056. Do they suffer from shortage of fodder at particular seasons?—Sometimes there is shortage of fodder.

43,057. Have you studied this system of preserving fodder by means of a pit, making silage?—No. We have good pasture grounds; we have grass and fodder crops.

43,058. Your months of shortage are November, December and January?—Yes, those three months.

43,059. Have you any suggestions to make for remedying that shortage?—I have no suggestion but that of storing in good seasons; wheat straw can be stored.

43,060. Is it stored as straw, and then cut for *bhusa* when it is taken out of the stack?—Yes. Some people buy it for speculative purposes and sell it when it is dearer.

43,061. Are lectures given in the district with which you are familiar?—I do not think they are given yet, but they ought to be given.

43,062. Do you think they would become popular?—Yes, there is no doubt they would; that is the only way of approaching the people.

43,063. Has the practice of agriculture changed at all within your recollection? Is there any improvement in the system?—Yes, there is some improvement.

43,064. Do you think that the average cultivator has confidence in the recommendations of the Agricultural Department?—Yes; they have to some extent where they see it being practically done before their eyes.

43,065. Is your locality a canal irrigated area?—Yes; there is a *kharif* channel where they only get one crop; where there is perennial irrigation, they get two crops.

43,066. Are there any tube wells in the neighbourhood?—No.

43,067. Are there any ordinary wells?—Yes; in my village there are 22 wells; the *rabi* crop is generally grown on that land by lift irrigation.

43,068. Are these wells irrigating land which is also commanded by a canal?—No, canal irrigated land is separate from this.

43,069. I thought perhaps well-water was supplementing water at a time when the canal-carried water was not available?—No, that is not possible, because rice wants a lot of water and only the canal can supply that water.

43,070. You say with confidence that the co-operative credit movement in your district has substantially improved the economic position of the cultivator?—Yes, I am certain it has.

43,071. Has it eased the load of debt?—Yes, many people have redeemed their mortgaged lands and have become very prosperous; they are now free from the moneylenders.

43,072. Have many societies failed in your district to your knowledge?—I think very few.

43,073. So that the movement and the principles of co-operation carry a good name in that district?—Yes, a very good name indeed.

43,074. Are there many critics?—Yes, of course there are those who are hit by it.

43,075. The moneylenders?—Yes, they are the only ones.

43,076. That is human nature?—Yes. But it is a great thing for the agriculturists.

43,077. Are there any other critics?—I do not know.

43,078. Do many of the more conservative cultivators stand out against joining the co-operative society?—Yes, of course; the moneylenders are the only people who are opposed to co-operation.

43,079. What type of primary society do you favour: a small primary society of say 50 members or a large one of 200?—They are both good.

43,080. You think there is room for both?—Yes.

43,081. *Professor Gangulee*: You do not farm your own land?—No, I do not; I lease it to tenants for farming.

43,082. Can you tell us whether the educated landowners of your district are disinclined to farm their own land?—No, they are not disinclined, provided there is a profit, if some expert from the Agricultural Department shows them how to cultivate the land so as to make a profit out of it.

43,083. That is the only thing you want?—Yes.

43,084. With proper guidance, the landowners of your district would farm their own land?—Certainly. I would do it myself.

Mr. Shiv Dev Singh.

43,085. Have you asked for the assistance of the department?—No.

43,086. From where do the cultivators of the district obtain the seed they require?—There are certain stores, but more societies are required for storing seeds.

43,087. Are these stores maintained by Government?—Yes, by the Agricultural Department.

43,088. Do you know where your own tenants get their seed from?—They generally use the seed they grow on their own fields.

43,089. They do not obtain seed from Government stores?—Sometimes, but this year they did not.

43,090. I understand that in your district you depend chiefly on well irrigation?—Yes.

43,091. What water-lifting arrangements have you? The Persian wheel?—Yes, worked by a bullock.

43,092. Can you suggest any practical methods by which Government might encourage the sinking of new wells?—Government could give *taccavi* for it; that is the only way.

43,093. Is cattle-breeding by itself a profitable business proposition?—In our district we do not breed cattle for sale.

43,094. No one has taken to cattle-breeding as a profession?—No.

43,095. Is there a co-operative cattle-breeding society?—I do not remember.

43,096. On page 384 you refer to adult education, and you say no non-official agency exists in this Province. Can you explain why that is?—No one has taken the matter up.

43,097. Have District Boards taken any interest in it?—I do not know.

43,098. You suggest that cattle dealers give cattle on credit. Is that a common practice?—Yes.

43,099. How do they realise their money?—When the crop is ready the people pay them from the sale of the produce of their land.

43,100. What happens if the animal dies?—They have to pay just the same, and they often find it difficult to do it.

43,101. Do they execute any bond?—Yes, there is a regular bond. Sometimes they are sued in court.

43,102. You seem to suggest there is no long-term credit system in your district as yet?—That is so.

43,103. How do the cultivators obtain long-term loans?—They have to go to the ordinary moneylender; but I think the mortgage banks which are now being considered will advance long-term loans.

43,104. Is there any subsidiary industry in your district to which the people might turn?—No.

43,105. *Mr. Kamat*: Have you heard of the activities for the welfare of the agriculturist carried on in the Gurgaon district by Mr. Brayne?—No.

43,106. Suppose a reduction in the land revenue assessment were given to the agriculturist, would that encourage to a considerable extent the planting of trees for fuel and other purposes?—Yes.

43,107. Similarly, would it also encourage the enclosure of pastures?—Yes.

43,108. Do you think that would be a very good scheme?—Yes.

43,109. You support both those ideas?—Yes.

43,110. Have you anything to suggest as supplementary occupations for the agriculturist?—No.

43,111. What about rope-making, basket-making and toy-making?—The agriculturists cannot take up these things unless there is someone to guide them and show them what to do. If some department took the matter up, something might be done.

43,112. No guidance is being given at present?—That is so. If it is given, it will be followed.

43,113. At present it is no man's business to interest himself in these things?—That is so.

43,114. No department is looking after it?—That is so.

43,115. Do you think the time has come when the Local Government should appoint an officer to take up this matter in earnest?—Yes.

43,116. It should be carried beyond the talking stage?—Yes.

43,117. *Mr. Roberts*: Do not the villagers do rope-making? Do they not make their own ropes?—Yes, for their own use, but not to a large extent.

43,118. You mention *mohwa* cake as having given good results. Can you give us any specific information about that?—No.

43,119. Have you tried it yourself?—No.

43,120. What made you say it had given good results?—I have heard from people who have tried it that it is useful.

43,120A. What has your education been? Have you been to college?—No. I was educated privately.

43,121. You learned English at home?—Yes, and I improved my education by private study.

43,122. Did you answer this Questionnaire yourself?—Yes. I am fond of reading and writing in English.

43,123. *Mr. Barron*: How long have you been an Honorary Magistrate?—About twenty years.

43,124. How much land have you?—6,000 acres, in different places.

43,124A. Mostly in the Sialkot district?—Yes.

43,125. Do you cultivate the land through tenants?—Yes.

43,126. Tenants at will or occupancy tenants?—Tenants at will.

43,127. Paying *batai*?—Yes, and on the direct system.

43,128. Paying a cash rent?—Yes, and also grain.

43,129. Have you ever applied to the Agricultural Department for advice about the working of your land?—No.

(The witness withdrew.)

Mr. GHULAM HASAN KHAN, Hon. Secretary, The Mianwali Central Co-operative Bank, Ltd., Mianwali.

Replies to the Questionnaire.

QUESTION 5.—FINANCE.—(*a*) Agricultural operations can best be financed through co-operative societies. This system engenders the habit of thrift and self-help among the agriculturists and there is the further advantage of control over the use of the loan by the borrower, i.e., there is always a supervising institution to see whether the borrower has employed the loan for a productive purpose or not. Current agricultural expenses requiring small sums of money can be financed through primary village societies and big enterprises through co-operative land mortgage banks.

Mr. Ghulam Hasan Khan.

Short-term credit can be easily met through primary co-operative societies, financed, in their turn, by central co-operative banks. The latter institutions have become sufficiently established in this Province and possess enough funds to meet the present requirements.

As regards the provision of long-terms credit to cultivators, the best means is, as stated above, through the co-operative land mortgage banks, but the difficulty experienced in such banks now in existence is that, for their funds, they solely depend on Government loans. There is no other regular and independent source of finance. As these banks have to advance long-term loans of considerable amount, ordinary fixed deposits by individuals, which are generally for one year, cannot be reasonably accepted by these banks. Some definite scheme for placing the finances of these institutions on a more secure basis must be evolved. I would suggest two methods:

1. The major portion of the Government *taccavi* grant should be advanced to these banks. It will also tend to enable these banks to lower their rate of interest.

2. The issue of debentures. But this method can succeed only if the Government guarantees such loans.

(*b*) The present Government system of *taccavi* is denuded of much of its benefit by the system of red tape-ism one has to encounter before getting a loan and similarly at the time of its repayment the same hardships are to be endured. Generally, many deserving and modest people can never expect to succeed in getting a loan. The major portion of the loan is grabbed by quite undeserving people.

I would suggest that *taccavi* loans should not be advanced through the revenue authorities of a district. All provincial *taccavi* grants should be placed at the disposal of the Registrar, Co-operative Societies, who should, in his turn, apportion it to each district and advance it through the central, co-operative and land mortgage banks.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) In my opinion the main causes of borrowing are:—

1. Uncertainty of crops; seasonal disasters and limitless fragmentation of holdings.
2. Cattle mortality.
3. Ancestral debt and the methods and malpractices of the indigenous moneylender.
4. Habits of thriftlessness, improvidence and lack of forethought. For this even the moneylender is responsible to some extent.
5. Lack of cottage industries to keep the agriculturist busy during days of leisure.
6. Extravagant expenditure on death and marriage ceremonies.
7. Litigation.

(ii) The main sources of credit are:—

1. Individual moneylender, which again may be described under two separate heads, the agriculturist moneylender and the non-agriculturist moneylender.
2. Co-operative societies.
3. Government *taccavi* loans.
4. Joint Stock Banks.

(iii) The reasons preventing repayment are:—

1. The presence of more than one source of credit at the disposal of an agriculturist, viz., local *sowcars*, co-operative societies, *taccavi* loans, &c.
2. Failure of crops.
3. Ancestral debt payable to local moneylenders, coupled with the malpractices and unscrupulous tactics of the latter.
4. Habits of extravagance and lack of forethought.

5. The present system of law relating to execution of decrees for money.

(*b*) 1. Greater spread of the co-operative movement.

2. Insolvency should be made easier for an agricultural debtor. At present, although a debtor is groaning under debt and has absolutely no prospect of being able to extricate himself from the burden except through insolvency, still the doors of the insolvency court are closed for him, because his assets in land are more than his liabilities. It is not taken into account whether his income from those lands, net or gross, for an average of ten years can be sufficient to liquidate his debts. The insolvency law should be amended in so much as the assets of an agriculturist debtor who applies for insolvency should be calculated by the total of his ten years' net income from his lands and not from the market value of the lands.

For the more backward districts of the Western Punjab where the agriculturists are hopelessly involved in debt, a special Insolvency Commission should be appointed. This Commission may, after inquiry, compulsorily adjudge a debtor as insolvent.

3. Some special enactment should be passed for the purpose of preventing the accumulation of interest for long periods and fixing a maximum rate of interest. The present Usurious Loans Act of 1918 has proved insufficient to attain the object for which it was passed. Generally the courts seldom apply its provisions and, even when it is applied, it tends very little to ameliorate the condition of the debtor. It would be better if this Act were repealed and, in its stead, a special enactment applicable throughout British India were passed containing, besides the provisions of the Usurious Loans Act, other provisions also to the effect that no creditor should be entitled to recover interest exceeding the principal amount originally lent.

4. Special enactments should be passed compelling a moneylender to keep regular and standard account-books and to also keep the borrowers regularly posted of every transaction, to supply the latter with copies of their accounts and also to send them half yearly balance sheets, &c.

5. Last but not least, I would suggest that the co-operative land mortgage banks should be encouraged as far as possible to undertake redemption of mortgages, liquidation of old ancestral debts, and the improvement of land. The Government should lend these banks money at a low rate of interest. Also the Government should provide these banks with facilities for the inspection of revenue records and obtaining copies of them, and should make it incumbent on the revenue officials to give them all possible help and information.

(*c*) Measures like the Punjab Alienation of Land Act should be enacted in every Province.

In my opinion it would not be advisable to restrict or control further the credit of cultivators. The Punjab Alienation of Land Act provides sufficient restriction and has been serving a most useful purpose. To place a restriction greater than what this Act provides will be harmful to the interests of the cultivator. Moreover, I would suggest that practices to circumvent the provisions of the Land Alienation Act be made penal. The law of *Benami* should be amended so as not to leave any loophole for frustrating the object of the Act.

Non-terminable mortgages should be prohibited. A maximum period of twenty years should be fixed for all mortgages.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) 1. It should be fixed by law that at the time of sub-division of a holding a minimum area standard should be observed for every field.

2. Consolidation of holdings should be taken in hand by the Government through the Co-operative Department, assisted by able and experienced

revenue officers, and special and adequate grants should be sanctioned for this purpose.

(*b*) The chief obstacles in the way are:—

1. Difference in the quality of soils.

This can be overcome by adopting different valuations for each kind of soil. Roughly, soils may be divided into three or four qualities. Moreover, practically it depends upon the cultivator himself to improve an inferior soil. By adoption of more scientific methods of agriculture inferior soils can be improved.

2. Foolish sentiments of the zamindars.

By the steady spread of education this obstacle will soon lose its force. Propaganda on right and judicious lines can also do much in this direction.

3. Presence of minors, persons suffering under a legal disability, widows with life interest, emigrants, &c.

This obstacle can be removed very easily by special legislation.

(*c*) Yes. Special legislation is most necessary. As I have mentioned above, the consolidation work can best be done through Consolidation of Holdings Co-operative Societies, and if two-thirds of the owners of a village consent to consolidation, the remaining one-third should be compelled through legislation to accept the decision of the majority. Moreover, if a member is aggrieved by any decision of the society, he can have the benefit of arbitration. He will be saved the ruinous expense, trouble and waste of time which a regular civil suit involves.

QUESTION 8.—IRRIGATION.—(*a*) (i) The scheme of the Sind Sagar Canal for the Sind Sagar Doab, comprising the districts of Mianwali, Shahpore, Jhang and Muzzaffargarh has hung firee for a very long time. By the opening of this canal (perennial), immense waste and barren tracts of the above mentioned four districts will be turned into very rich and fertile lands and a great deal of the poverty and suffering of the people of the territory concerned will be ameliorated.

2. There is a non-perennial canal, called the Nammal Canal, in the Mianwali Tehsil of the Mianwali district. As it exists at present, being solely dependent on the rainfall which is very scanty in this part of the country, its advantages are of a very precarious nature. This canal can be made into a perennial one by connecting the waters of the Uchhali Lake, situated a few miles distant, to those of the Nammal Lake. The Uchhali lake is of huge dimensions and is said to possess sufficient sources of percolation to render the utility of the Nammal Canal of a more secure nature, to extend its influence to a much wider area of land, almost two-thirds of the Thal *ilaqa* of the Mianwali *tehsil*.

As regards the first-mentioned scheme no apparent reason can be given for not carrying it out except unwillingness of the Government. It is possible that the area called the Thal Kalan, situated in the Bhakkar *tehsil* of the Mianwali district, may be uncommandable, but that area is almost negligible when compared with the area which can be commanded by such a canal. It was even proposed to the Government that if the Government was not prepared to launch this scheme, there were persons of capital and enterprise ready to form a company and undertake it, provided the Government annulled the Sind Sagar Canal Act. But the Government did not consent to this even.

As regards the second scheme, there is no insuperable obstacle in the way. Of course the Uchhali Lake is situated in the mountains and some miles of mountainous country intervene between the Uchhali and the Nammal Lakes. Yet several engineers who have seen the spot are unanimously of opinion that this scheme can be accomplished easily because the Uchhali Lake is situated on a considerably higher level than the Nammal Lake.

QUESTION 22.—CO-OPERATION.—(*a*) (i) 1. The Government should give more grants to the co-operative movement.

2. Government *taccavi* grants should be placed at the disposal of the Registrar, Co-operative Societies.

3. Land mortgage banks should be encouraged and their finances should be placed on a securer basis.

4. Laws making the execution of awards easier should be passed. The co-operative societies should be allowed to get their awards executed through magistrates as fines, or through the civil courts as arrears of land revenue.

5. If the awards of co-operative societies in general be not made recoverable as arrears of land revenue, at least this should be allowed for the awards of the land mortgage banks. It is most necessary for the working and safety of these banks.

6. Co-operative societies should be given special representation in the Councils.

7. The present Sub-Inspector staff of the societies is not up to the mark. It is a clog on the progress of the movement on right lines. The non-official agency, i.e., the Punjab Co-operative Union has not got funds enough either to ameliorate the lot of the present staff or to engage better staff in future on better terms of pay. The sub-inspector is the root in the tree of co-operation and his unability or unfitness more than counterbalances the zeal and ability of the superior staff. The Government should grant a handsome annual sum to the Punjab Co-operative Union in order to enable it to engage better qualified sub-inspectors.

8. Up to this time the Government has issued only advisory orders for the local bodies to invest their funds with the co-operative banks. These orders should be made mandatory. The local bodies will lose nothing by such orders, as co-operative banks allow a higher rate of interest than all other institutions.

9. The Government should give the stamp vending business to co-operative societies.

(ii) 1. Local bodies should give regular grants to co-operative institutions in cases where the work of both is for the same purpose. For example, the District Boards should give grants to educational co-operative societies, and the Municipalities to urban educational societies, and similarly.

2. District Boards should co-operate with this department in a fuller manner.

(*b*) Credit societies have done a lot of good. These are steadily growing in popularity. But they are fighting a deep-rooted and long-standing evil, and unless the rural masses get more educated and the subordinate co-operative field staff, i.e., the Sub-Inspectors, are improved, it will be very difficult and will take a very long time to achieve the full measure of benefit from this form of co-operation.

Another fact which needs attention regarding this point is that at present the central financing institutions can lend money to the credit societies at the minimum rate of 9 per cent. per annum. The societies in their turn lend to their members at 12½ per cent. per annum, which is rather a high rate of interest. Some means should be taken to lower this rate.

(v) The work taken in hand by these societies is one of the most beneficial. Now it has been established beyond any measure of doubt that this work can be done most successfully by the co-operative societies. But a picked staff is needed for the purpose.

(*c*) Yes. Legislation should be introduced in order to compel the unwilling minority to join for the common benefit of all.

(*d*) Yes. These have achieved their object to a great extent, but not fully. Some forms of societies have proved quite unsuccessful, e.g.,

co-operative supply stores. There are other forms of societies which are still in the experimental stage, e.g., cattle-farming societies; better-living societies; better-farming societies, &c., and no opinion can be given about these at this stage.

Oral Examination.

43,130. *The Chairman*: Mr. Ghulam Hasan Khan, you are Honorary Secretary of the Mianwali Central Co-operative Bank?—Yes.

43,131. We have a note of your evidence. Is there anything you wish to add at this stage, or may we ask you some questions?—I have nothing to add.

43,132. You point out on the first page of your note that there is need for the provision of long-term credit, and you suggest that the land mortgage bank system might be extended?—Yes.

43,133. You go on to point out that one of the difficulties in starting such banks is the fact that they have no regular and independent source of finance other than Government?—Yes. There is one other source; they are financed by the Punjab Co-operative Union. They are now being financed in addition by money got from selling the debentures of the Punjab Provincial Bank.

43,134. If the public were educated up to the idea of lending money on the collective security of a group of mortgages, would not that difficulty be very largely removed?—I do not think the public will be ready to advance their money through this system at this stage. They want a Government guarantee.

43,135. They want the security of a particular mortgage?—Yes. If Government were to guarantee the debentures any amount of money could be raised.

43,136. If Government guaranteed the interest on the debentures?—Yes.

43,137. *Mr. Calvert*: You are speaking of a rather backward district?—Yes. I come from Mianwali.

43,138. *The Chairman*: On page 393 of your note you deal with *taccavi* loans, and you say the present Government system of *taccavi* is denuded of much of its benefit by the system of red-tapeism. Are you sure there are unnecessary formalities?—There are too many formalities as well as too much delay, and, moreover, if a man applies for Rs.50 he gets Rs.35 or Rs.40 only; he has to tip somebody.

43,139. The red tape costs money, as well as causing delay?—Yes. The greatest defect is that the greater part of the money is obtained by undeserving people.

43,140. One might call it wastage by seepage and evaporation between the head-waters and the tail of the system?—Yes. I know of cases (there are many) where a landlord has got anything from Rs.2,000 to Rs.3,000 in the name of his tenants. The tenants did not get a single anna; the landlord got it all.

43,141. Is the co-operative movement making headway in your district?—Very much.

43,142. For how long has it been firmly established in that district?—It was started in 1919 and it is now in a very strong position.

43,143. With how many primary credit societies is your bank dealing?—350.

43,144. Are most of them healthy?—Yes.

43,145. Are there many failures?—Up to now no society has failed, but there are some on the verge of failure.

43,146. Can you attribute their impending failure to any particular cause?—Yes. The people in the Bhakkar *tehsil*, where most of the trouble occurs, are very backward in every respect; moreover, the moneylender is very strong in that part of the world.

43,147. Why is it the societies do not prosper? Is it because members are unpunctual in their repayments?—To a great extent, yes.

43,148. But you hope that, with patience and good administration, it may be possible to educate your co-operative public in the backward districts and so bring these societies to a better condition?—Certainly.

43,149. What exactly have you in mind when on page 394 you suggest that one cause of trouble is "the present system of law relating to execution of decrees for money"?—Now, specially in our Province, a ruling has been passed by the High Court which enables the decree-holder to have the judgment-debtor sent to the civil jail in the first instance without applying for other remedies which are open to him; therefore, the decree-holders have been taking advantage of this ruling most vindictively and agriculturists are being sent to the civil jail, especially at the time of sowing or reaping the crops.

43,150. You next make a proposal that insolvency should be made easier for the agricultural debtor and that his net income should be taken as the measure rather than the total value of his assets?—Yes; I was thinking of the special circumstances of my own Province because the Land Alienation Act applies in this Province and a man cannot sell his property. There is no open market for the property. The market price of the land should be taken into account at the time of calculating the assets, for, suppose a man has got land, the market value of which is Rs.10,000, and he has got a debt of Rs.5,000, he cannot liquidate his debt from the net income from his land. If he applies for insolvency, though he has a debt of Rs.5,000, the judge will say that his assets are more than his liabilities, and therefore he will not be declared insolvent, as the law stands at present.

43,151. Has he borrowed on the security of his land?—But his creditors are not willing to take that, because it is not compulsory for the creditors to take the land on mortgage.

43,152. *Mr. Calvert*: Your point is that under the Land Alienation Act agricultural land cannot be sold in execution of a decree?—Yes.

43,153. And if he mortgages it to another moneylender, that will only be for twenty years?—Yes.

43,154. *The Chairman*: In your view, has the Punjab Alienation of Land Act proved a success?—It has not proved a complete success.

43,155. Would you like to see it repealed?—Certainly not; there are certain loop-holes, no doubt.

43,156. There are still loop-holes, and you want to stop the loop-holes?—Yes.

43,157. In your view, would public opinion support a proposal to enforce consolidation of fragmented holdings against a one-third minority?—I was not thinking there of my own district, because in my district the holdings are large enough; but generally in the central Punjab, where the holdings are sub-divided to a very small size, it will be a good measure.

43,158. You say in your district the holdings are still comparatively large in extent. How long has the land been cultivated there? Is there any record?—The land there can be divided into two portions: one is called the "*kutcha ilaka*," which is the basin of the river Indus and which

depends on the annual floods of the river; it is cultivated from the old times. The other is known as the "*thal ilaka*," which is a sandy tract, and which wholly depends on rainfall; there the cultivation has begun only during the last 25 or 30 years.

43,159. In the case of the "*kutcha ilaka*," are the holdings still fairly large in that tract?—Yes.

43,160. It is a matter of density of population, I suppose?—Yes, the population is scarce there.

43,161. But are there indications that fragmentation will come about?—Yes; it may be within the next 10 or 15 years.

43,162. If I asked one of the cultivators in your district whether he had heard of the Agricultural Department, what would be his answer, do you think?—His answer will be that he does not know whether the Agricultural Department exists or not, because the department has only started its activities in our district about a year or two ago.

43,163. So that they are just making a beginning in your district?—Yes.

43,164. There is no perennial irrigation in your district, is there?—No.

43,165. Are there any tube wells?—One of the local men got one dug and it failed; another was dug by the District Board and it also failed.

43,166. So that it looks as though there was no supply of water in the sub-soil?—I do not know the causes of the failure.

43,167. How far down did they go, do you happen to know?—No. One was on the bank of the river Indus, and there the level of the water is not very deep. But the other was in the '*thal ilaka*,' and it might have gone to 250 or 300 feet.

43,168. They both definitely failed?—Yes.

43,169. On page 396 of your note you say: "The present sub-inspectors' staff of the societies is not up to the mark. It is a clog on the progress of the movement on right lines." Will you tell the Commission quite frankly what your complaint may be about the sub-inspectors' staff?—The fact is that the present staff, the majority of them at any rate, do not know fully the meaning of co-operation.

43,170. They have not been sufficiently well educated in co-operation?—Yes; they get their training for one month in the regular classes and then they are sent to the Inspectors to do field work.

43,171. They get one month's intensive training and they are put on the field to work with the Inspectors?—Yes.

43,172. You do not think it is sufficient?—No, it is not sufficient. Moreover, their education is below the standard. Till now only matriculates or people below the standard have been taken into this service. I want them to be people who have passed the Intermediate examination at least.

43,173. Would they cost you more?—Yes.

43,174. But you think that would be worth while?—Yes. Only the inspecting staff of this department is all that can be desired; but these sub-inspectors are not quite fit.

43,175. In your district, in the credit primary society that you know of, does the sub-inspector attend at times when members are applying for loans? Do you see him very often in the room when the members are applying for loans?—At that time I do not think the sub-inspector is present.

43,176. It follows that you do not think the sub-inspector will be in a position to make any improper charges on the applicant before he will recommend the loan?—No; there are some stray cases when the sub-inspector

recommends an application after charging some fee; but such cases are very few.

43,177. You are not thinking of that when you make this complaint?—No.

43,178. It is just a matter of men not being quite as efficient or as well up in the principles of co-operation as you could wish?—Yes. Moreover, if a better educated man is taken in, certainly his moral notions will also be better.

4,179. Do the sub-inspectors improve as they gather experience?—They may; but there is very little scope for improvement in a man who has read up to the vernacular middle standard or up to the 9th or 10th class.

43,181. On page 396 you say: "District Boards should co-operate with this department in a fuller manner." Is that the Co-operative Department?—Yes.

43,182. What exactly are you thinking of?—At present the District Boards, at least many of them, have not realised that the work of the Co-operative Department covers much of the work which is entrusted to the care of the District Boards.

43,183. Your suggestion is that District Boards might work in with the co-operative societies, that the local authority might combine with the co-operative organisation?—I do not mean that they should be amalgamated with the Co-operative Department; they ought to be separate.

43,184. *Sir Henry Lawrence*: On page 394, paragraph 4, you suggest that special enactments may be passed compelling a moneylender to keep regular and standard account books. Have you seen the law that was put before the Council towards that end?—Yes.

43,185. Was that enactment passed by the Council?—It was passed by the Council but rejected by the Government.

43,186. On what ground was it rejected, do you know?—The Government said that it was defective in some respects, and that they would put in a new Bill on the lines on which the Government thought it proper that such a Bill should be passed.

43,187. Is that Bill being prepared now?—I have no information about that.

43,188. Is there a general feeling that something should be done to enforce regular account keeping?—Yes.

43,189. *Sir Thomas Middleton*: Have you got a Co-operative Land Mortgage Bank in your District?—Yes.

43,190. Can you tell me whether it is doing much business?—It was started in June, 1924, and up to this time it has advanced about Rs.80,000, and about 2,500 acres of land have been redeemed; but I do not consider that to be much business.

43,191. In view, I suppose, of the enormous amount of debt on the land?—Yes; because before this Bank was opened I got some enquiries made through the Deputy Commissioner of the District, and it was discovered that about eighty lakhs of mortgage debt existed in two *tehsils* of the district.

43,192. So that the proportion hitherto redeemed by your Bank is very small?—Yes.

43,193. What prospect do you see of expanding the work of the bank rapidly?—In the Bhakkar *tehsil* there is not much prospect, because most of the land is mortgaged to the moneylenders; if an appeal goes to the High Court, and if there is no decision on the point for five years the land cannot be redeemed, because there are heavy rates of interest in kind, and without

going to the civil court the mortgagee will not accept any amount less than the original amount fixed.

43,194. Up to what percentage of the value do you advance on mortgage?—Fifteen times the net profits.

43,195. A great deal of the land in your district will be mortgaged to a much heavier extent than that?—I do not think so, because the value of land in our district rose about fifteen years ago, and the older mortgages are for small amounts as compared with the price of the land. Let me illustrate my point; about 5,000 *kanals* of land are mortgaged for Rs.14,000, and the present market value of land of that quality would be Rs.35 per *kanal*.

43,196. I understood that the difficulty in many parts of the Punjab was that the original mortgage, plus the accumulated interest, much exceeded the value of the subject?—That may be the case in Central Punjab, but in our District it is not so. In recent mortgages, when there was a boom and the price of the land rose very high, the original mortgage plus the interest might have exceeded the value of the subject. Many applications were made, but they were ultimately rejected.

43,197. Your district seems to be a very suitable one for Land Mortgage Banks to take up work in?—Yes.

43,198. *Mr. Barron*: Are you a zamindar?—Yes.

43,199. How much land do you own?—About 207 *kanals*. I am not much of a zamindar myself, because my father is alive, and the land that I have is self-acquired.

43,200. Have you any profession?—I am a lawyer.

43,200A. A B.A., LL.B.?—Yes.

43,201. Do you practise as a lawyer?—Yes.

43,202. As well as carry on the work of Honorary Secretary of the Central Bank?—Yes; I am also the Honorary Secretary of the Co-operative Mortgage Bank.

43,203. *Sir James MacKenna*: What is the capital of your Central Bank?—It is about five lakhs now.

43,204. How much in deposits have you from individuals?—About Rs.2,00,000.

43,205. Is that from the people of your neighbourhood?—The major portion is from the people of the district.

43,206. That is the area in which the bank operates?—Yes. In this connection I might mention that about one lakh of rupees has been deposited by one person, a Nawab; he is now dead, and his property is managed by the Court of Wards; the rest of the deposits is by individuals.

43,207. Did the Court of Wards put the money there?—No, the Nawab himself put it in before he died.

43,208. How many societies have you of the "A" class?—There were three "A" class societies last year, but now there are only two.

43,209. Are the bulk of your societies in the "B" and "C" classes?—Yes; but half the societies are unclassified.

43,210. Has this Central Bank any power of inspection of the primary societies in its circle to see that the money lent by the Central Bank is being properly applied?—I do not think that there is any hindrance in this, because the Central Bank lends the money, and it ought to be able to inspect, but this has not been done.

43,211. The Central Bank knows the position or stability of the primary societies, I take it?—Yes.

43,212. So that you have no fear of large defaults?—No, because the liabilities of the members of the society are unlimited, and therefore we have got no fear.

42,213. *Professor Gangulee*: How do you utilize your reserve fund? Have you considerable reserves?—Our bank is a new one; it was started only in 1921, and there is not much reserve; we have invested it in Government securities.

43,214. Do the primary societies also invest their money in the bank?—There are about three or four societies, and they have invested their reserve funds in our shares and fixed deposits.

43,215. Talking about this Land Alienation Act, you said that there are some loopholes. Could you give us one or two instances of such loopholes?—The chief loophole is the *benami* practice.

43,216. How does that work?—A person who is not an agriculturist wanting land strikes a bargain with the zamindar, and he also induces another agriculturist to become a *benamidar*, that is to produce the land in his name, and he gets a loan bond executed by that *benamidar*. There are two defects in this system: one is that generally in most cases the non-agriculturist gets that loan bond executed with interest, and if the land deteriorates, or, if he finds after two or three years that his principal *plus* his interest exceeds the value of the land, he sues the man for that debt, otherwise he takes the profit of the land, and the other man is only a *benamidar*. It may be that sometimes for the consideration of his having become the *benamidar* this man is made the tenant of that land.

43,217. Have you any non-credit co-operative societies?—Yes.

43,218. What sort of societies are they?—One is a better farming society started about five or six months ago; one is the Islahi Rasumat society; I do not think that it has been registered up to this time. There are also adult school societies, and I think there are also some night-school societies.

43,219. How are these adult school societies progressing? Are you in touch with any of them?—Yes, I know some of them; of course it depends upon the honorary workers of each society whether the results are good or not; in societies where there are good honorary workers the results have been very good; in others they have not been as good as they might have been.

43,220. *Mr. Calvert*: Has the co-operative movement extended now across the Indus?—Yes, there are about forty societies in Isakhel which are the best societies in the district.

43,221. Are their members mostly Pathans?—Yes.

43,222. Does the Post Office run the money order system there?—Yes.

43,223. In your district the vast majority of the people are Mussalmans?—Yes, about 94 per cent.

43,224. Where are you getting funds from for your co-operative Land Mortgage Bank?—At first we got our funds from the Punjab Co-operative Union, and we also got Rs.30,000 from the Government, but now Rs.12,000 of that has been taken by the Punjab Provincial Bank. A Nawab gave us a deposit of Rs.15,000, and there was a deposit of Rs.1,000 from another man; we have now returned those deposits because they were for one year.

43,225. Have you actually in your Mortgage Bank applications for loans pending?—At the present time there are applications for loans pending.

43,226. You are getting more funds?—Yes, we can get more funds. My reason for praying for more funds is that if many mortgage banks are opened in this Province, they will of course want funds because, as I understand, Government only grants about 3 lakhs to the Registrar for this purpose, and that is not sufficient for many banks.

Mr. Ghulam Hasan Khan.

43,227. Are you also a representative of Mianwali on the Punjab Co-operative Union?—Yes.

43,228. Have you heard that debentures of the Provincial Bank have been floated?—They have been floated and have been very successful.

43,229. Did you get any money through those debentures?—Yes, we got Rs.12,000 because the Provincial Bank took away Rs.12,000 of the Government loan, and they told me yesterday they were prepared to take the rest of the Government loan.

43,230. You say that a maximum period of twenty years should be fixed for all mortgages?—Yes.

43,231. Would you extend that to mortgages between all zamindars?—Certainly.

43,232. In your district is not there an irrigation rule that the first right to water belongs to the man higher up?—Yes, there is.

43,233. Do you think that is a good rule?—It prevents disputes.

43,234. Would you like to apply that to the Indus?—The Indus does not need such rules, and those rules cannot control the Indus.

43,235. Are you not aware that your Sind Sagar canal has been held up by the Bombay Government?—When I spoke of the unwillingness of the Government, I meant that the Government were giving undue preference to the people of Bombay rather than to the zamindars of the Punjab.

43,236. Do not you think that that is very wrong?—It is.

43,237. What do you think of the work being done by the Punjab Co-operative Union?—The Punjab Co-operative Union is doing very good work; I think the Government should support it in certain branches of its activities and should give it more help because the funds of the Co-operative Union, as they now exist, are insufficient for the extension of the work.

43,238. There are certain people who think the Punjab co-operative movement is too official; what do you think of that?—I do not think it is too official; official supervision is needed. The main portion of the work of the co-operative movement is done by honorary workers and by the zamindars themselves; the officials are there only to guide the zamindars on the right lines. In the whole of the Co-operative Societies Act there is no mention of any officer or official; they are merely guides; they do not interfere in any matter; they are not on the managing committees of the Central Bank, of the Land Mortgage Bank, or of any society; they are merely advisers.

43,239. As far as your Central Co-operative Bank is concerned, you have no trouble from official interference?—No.

43,240. Was it not in Mianwali that some of the very earliest co-operative societies in India were started?—Yes, several co-operative societies were started in Mianwali by Mr. Crosthwaite in 1898 or 1899; two or three of them are still in existence; they are very good societies.

43,241. We have been told that the Land Alienation Act is preventing zamindars from getting credit; what do you think of that suggestion?—I do not think it is; it cannot be denied that it is a restriction on credit, but it does not prevent the zamindar from getting credit. What has a zamindar got? He has only got his land or his house. His houses are also classified as land, and the moneylenders certainly advance money on the security of the land.

43,242. Is there much land owned by moneylenders in your district?—Yes.

43,243. Is that land cultivated by moneylenders?—The total number of cultivating moneylenders may be a dozen or half a dozen throughout the district.

43,244. Would you like this Royal Commission to recommend that the Sind Sagar Canal should be constructed?—Most strongly, because the Bhakkar *tehsil* is larger than two average districts in the rest of the Punjab, and combined with the area in other districts which would be commanded by that canal, it will have an influence upon a very large part of the Province.

43,245. What about the poor suffering zamindars of Sind? Do you think they will lose their water?—I do not think they will. Mine is only a layman's opinion, but I think the Indus contains a very large amount of water; they will not be able to control it by any *bund*. Up to the present it has been considered that the Indus cannot be bound down. The old Mianwali town was washed away by the river Indus; a canal was dug, but the river changed its course, and that canal became a river.

43,246. *Mr. Kamat*: How many rivers has the Punjab which have big irrigation schemes?—All the rivers except the Indus have irrigation schemes.

43,247. If a neighbouring Province needs water, do you think the Punjab should have a monopoly of all its river waters and that the other Provinces should be starved?—No, I do not think that; but this scheme of the Sind Sagar Canal was thought of in the eighties, and the Government passed the Sind Sagar Canal Act. The Government should now either fulfil its promise or annul the Sind Sagar Canal Act. The Government should act fairly, it should either decide once and for all to dig this canal or annul the Act.

43,248. If another Province has also a big scheme to which that Province is committed, is it not equitable that that should be taken into consideration?—But that is a small scheme. We have also a prior right with regard to time.

43,249. Supposing *taccavi* loans were distributed through the co-operative societies, what would happen to those who were not members of the society and yet wanted *taccavi* help from Government?—They can easily become members of the co-operative societies; it does not cost anything to become a member of a co-operative society.

43,250. You mean that this should be used as a lever to compel people to join the co-operative society; is that your meaning?—No, that is not my meaning. If a man wants a loan, he can very easily become a member of a co-operative society provided he has got some credit. If he has not any credit, he cannot get a *taccavi* loan, even through the channel which is now maintained by Government. My meaning was that *taccavi* could be better utilised if advanced through the co-operative societies.

43,251. But supposing in a village there are only 27 persons who have joined a co-operative society, while there are 100 who have not and who want *taccavi* loans, how would your proposal work?—They can become members of that society or more than one society can be registered in that village.

43,252. Do you think it would be practicable to have a system by which the distribution of *taccavi* loans would be entrusted to co-operative societies with this special provision that they should be allowed to distribute it to non-members?—Certainly great difficulty would be experienced with regard to recovery because those non-members would not be subject to the law of arbitration.

43,253. So that it would not work in actual practice?—No.

Mr. Ghulam Hasan Khan.

43,254. In addition to the Honorary Secretary, is there a paid manager of your Central Bank?—Yes, one has been engaged about a year ago.

43,255. What is his salary?—Rs.75.

43,256. What is his banking experience or training?—At first he worked in our bank for about one month; then for about a month under the Accountant at our bank; he was sent to the Punjab Provincial Bank to be trained; the Punjab Provincial Bank sent him to the Lahore Provincial Bank; there he was trained for several months, and, when they gave him a certificate of fitness, he was engaged by us as manager.

43,257. Are there any Central Banks on the boards of which Deputy Commissioners have seats?—Yes, in nearly all Central Banks the Deputy Commissioners are chairmen.

43,258. What functions have they as chairmen?—They preside over the meetings, and generally the chairman supervises or superintends the business.

43,259. That being almost always the case, do you really think they do not influence the general policy?—It cannot be called an undesirable official influence.

43,260. You do not call it undesirable, but you do admit there is some influence?—Very rarely, and when there is, it is for the benefit of the bank, because sometimes the committees of the banks are not well educated and are therefore liable to go astray.

43,261. As a matter of principle, do you not think the co-operative movement ought to be a people's movement?—It ought to be, and it is so in the Punjab.

43,262 Even though you say that to some extent Deputy Commissioners influence the policy?—I think that is a thing which can be dispensed with now.

43,263. And the sooner you do it the better?—Yes.

43,264. *Mr. Roberts*: In answer to Sir James MacKenna, I think you said that you, as secretary of the Central Bank, dealt direct with primary societies. Is not the usual procedure that the Inspector recommends a loan for a primary society?—"A" class societies can deal with us direct, without the intervention of anyone. Many banks have also given this privilege to "B" class societies; our bank is now considering giving this privilege to them. As far as the other societies are concerned, as their condition is not considered satisfactory, it is laid down that their loan applications should come through the Inspector. The Inspector only recommends a loan; he does not sanction it. It is the Central Bank which sanctions it.

43,265. But in regard to the bulk of the societies, he recommends the loan?—Yes, because "C" and "D" class societies form the majority.

(The witness withdrew.)

The Commission then adjourned till Thursday, the 3rd March, 1927, at 10 a.m.

Thursday, March 3rd, 1927.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur, Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc. } *Co-opted Members.*

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } *Joint Secretaries.*

Mr. J. B. G. SMITH, Chief Engineer, Irrigation, Punjab.

Replies to the Questionnaire.

QUESTION 8.—IRRIGATION.—(*a*) I deal here only with perennial and non-perennial irrigation.

I will refer to wells under (*b*).

The districts in which I advocate extensions of irrigation are:—

(i) Rohtak and Hissar (perennial).
(ii) Jhang, Muzaffargarh and Multan (perennial and non-perennial).
(iii) Mianwali and Muzaffargarh (perennial).

The obstacles to extensions of irrigation in the above tracts are as follows. (N.B.—I should like to make it clear that these are not insurmountable; they are merely hindrances to immediate progress: ways and means of overcoming them are being sought):—

(i) *Rohtak and Hissar.*—The probable cost. This, under present conditions, prevents the most recent project for irrigating these areas, viz., the Bhakra Dam Project, from being a "Productive" work in the technical sense.

I may say here at once that on the basis of present-day costs, no scheme for the irrigation of these areas will be "Productive."

The only possible means of giving water to these areas is by one or more storage dams on the Jumna, Sutlej and Beas rivers, and as there are no Crown waste lands to be made irrigable thereby, and sold, the project cannot be "Productive" as an isolated unit under existing revenue rates which are outside the terms of reference. Great consideration must, however, be given to the economic advantages such a scheme must possess.

(ii) *Jhang, Muzaffargarh and Multan.*

(iii) *Mianwali and Muzaffargarh.*

I take these together.

The former are to be irrigated by the Haveli Project; the latter by the Thal.

The only obstacle here is the assignment by the Government of India o Bombay of all the winter supplies of the Indus River reaching Sukkur, hich includes what will reach it on the development of the Sutlej Valley roject from the five tributaries of the Punjab.

QUESTION 8.—IRRIGATION.—(*b*) I am satisfied with the existing trend of methods of distributing canal water to cultivators. The principle now being adopted and gradually extended is proportional distribution at outlets, with control points along the distributaries. Until such time as supplies entering distributaries can be automatically maintained constant, it is impossible to improve on this principle.

The internal distribution is in the hands of the cultivators. Recently a great advance has been made in some villages by the control of this internal distribution being taken over by the village *panchayat*.

No methods have been employed to prevent the waste of water by evaporation and very little has been done to prevent loss by absorption except in the way of experiments on which it has hitherto been accepted that the cost of efficient lining was prohibitive.

I do not know that anything can be done to prevent the former. The latter would be minimised by:—

(*a*) Lining of channels,

(*b*) A more rigid enforcement of Rule 9 of the Canal Act (slightly modified perhaps to commence with) for the proper sub-division of fields for irrigation.

Re (*a*) above the cost undoubtedly will be heavy, but it will probably have to be faced on a "protective" if not a "productive" basis.

The losses by absorption which contribute to the rise of the subsoil water-table brings the prospect of lifting water from wells—both percolation and tube—prominently to notice. And there can be no question that where the subsoil water has risen close to the surface, every effort should be made to encourage subsoil water to be lifted for irrigation. By "close" I mean a depth of 8 to 15 feet. The exact depth at which it is advisable to keep the subsoil water depends on the physics and texture of the soil and on its drainage, both surface and sub-surface, and on the liability of tracts to abnormal rainfall.

Mr. B. H. WILSDON, M.A., B.Sc. (Oxen.), Scientific Research Officer attached to the Irrigation Research Laboratory, Punjab.

Replies to the Questionnaire

QUESTION 1.—RESEARCH.—(*a*) (i) I classify research essential for agricultural progress under two heads:—

(*a*) Fundamental.
(*b*) Applicative.

The organisation, administration and financing of activities under these two heads is not necessarily best attained by the same methods.

Applicative work must of necessity be organised on a provincial basis. There appears to be a tendency to relegate fundamental research to a central organisation (the Government of India) which shall "co-ordinate" the application of results in the provinces. I wish to give my views on this thesis, which is, I consider, liable to produce dangerous consequences unless the scope of the word "co-ordination" is very strictly defined. Any authoritative pronunciation such as is expected of a Royal Commission, whereby functions of fundamental research and especially "co-ordination" are relegated to a central body, leaving mainly applicative research to local institutions, is likely to become an excuse to those in control of provincial purses for starving any but immediately "practical" lines of work. This would be disastrous in its results.

The most productive soil for fundamental research is in the University. A deplorable policy of isolation has been adopted in this country, and this has been as much the bane of research as of higher agricultural education.

While the universities in India have developed flourishing schools of research in which notable work, particularly in physics and chemistry, has been carried out by students under the guidance of professors, it is significant that practically no applied scientific research in agriculture has been carried out except in Government-paid posts. At Pusa, which should be the premier institution for applied research of this kind, I am informed, there is not a single voluntary research student on the premises. I would suggest that it is impossible to legislate for the whole scope of fundamental research in agricultural questions by expansion of isolated Government agricultural institutes. Much might be done by instituting a system of University scholarships for work on the borderland of agriculture and the pure sciences, as is done by the Board of Scientific and Industrial Research in England. The advantages proved in that case, are that not only do we attract to applied science the best brains, after a full training in the pure sciences, but that the universities themselves would profit by association with less purely academic research work. Suggestions of subjects suitable for "farmed out" research in this manner are made under (*b*) and (*c*) below. Grants for this purpose might well be administered by a central organisation which would be in intimate touch with the universities of India.

No new agricultural research institution should be built outside a university centre.

QUESTION 1.—RESEARCH.- (*b*) Until recently no provision has been made for the study of the special problems of irrigation agriculture. It is true that Lyallpur is in the centre of a canal colony, but since its foundation so much work of a general nature has devolved upon it that the intensive study of the purely irrigation aspects of agriculture in the province has been impossible. By irrigation I refer to both well and canal irrigation. A scheme to provide a field station for irrigation research has progressed in this province to the point of earmarking an area of land at Lyallpur for the purpose. The provision of staff and equipment has not yet been proposed.

The question of technical research in irrigation is so allied to agriculture that it may be referred to here. The main objects in view are detailed in the printed memorandum compiled by the Punjab Government.

QUESTION 1.—RESEARCH.—(*c*) Soil physics has received scant attention by the Indian Agricultural Department. A Soil Physicist has been recently appointed for Pusa and I believe another at Poona. The subject is of such importance that an officer, with the requisite physical and mathematical training, is as much necessary for the investigation of the problems of agriculture, as are chemists or botanists.

Valuable work on base exchange in soils has been published, singularly enough from the Calcutta University (by R. N. Mukerjee). Hydrodynamical questions, of which there is a plethora awaiting investigation might well be farmed out. The mathematical working out of agricultural statistics is another subject awaiting development. Some work of this nature was commenced by Mr. S. M. Jacob. The only satisfactory school of statistical mathematics with which I am acquainted is at Madras, but much might be done if the suggestions put forward above were adopted to improve teaching in other universities and encourage investigation of real problems. Agricultural meteorology is a subject allied with physics and statistics which requires much greater attention.

QUESTION 2.—AGRICULTURAL EDUCATION.—(*a*) The views I wish to put forward under this head relate particularly to the enlistment of scientific workers for agriculture. I consider that for this class of student a thorough

grounding in the fundamentals of science is more important than spending so many hours a day in "practical" agriculture. It appears to me a waste of time and energies for agricultural colleges to attempt to give complete instruction in the elements of the sciences as well as English and Mathematics, when by the extension of intermediate colleges ample supplies of prepared material can be obtained. By drawing on the intermediate colleges for students, the agricultural colleges would tap a much larger field of recruitment, avoid wastage due to failure in elementary subjects, and secure a better and more representative type of student. I therefore advocate that the teaching of the agricultural colleges should be limited to a three years' course for the B.Sc., to be followed by a research degree in the sciences applied to agriculture.

The need for the more general man, who will become a farm manager or be engaged in district propaganda work, may be met in the same manner, or by special courses in agriculture at district farms with a less scientific syllabus.

QUESTION 4.—ADMINISTRATION.—(*a*) I consider that the co-ordination of efforts as between the local and central Governments will be best met by an organisation on the lines of the Department of Scientific and Industrial Research in England. A permanent board or department of this nature should be formed which would be representative of both the Central and Local Governments. It should be entirely independent of Pusa or the Board of Agriculture. It should control the grants made for the up-keep of Pusa and additional funds should be voted by the Central Government, which would be devoted to the promotion and co-ordination of research in the Provinces on a contributory basis. Separate subjects would be represented by distinct committees of the Board. Close touch would be maintained by this method between University and Government research institutes in all parts of India. Such a *liaison* as is to be desired can only be made effective if money is involved. The method of contributory grants for special work would secure this.

The activities of such a Board should not be limited to purely agricultural research. The Meteorological Department Industrial Research, Irrigation, and Engineering Research, should all eventually come within its purview. A Government physical laboratory must at no distant date become an absolute necessity in this country and should be related to the Board in the same manner as the National Physical Laboratory is to the Department of Scientific and Industrial Research, or Pusa to the Board proposed for India.

Another difficulty which affects the promotion of special research work by Provincial Governments is concerned with the recruitment of superior officers. The practice has been to offer temporary posts of four years' duration, as such appointments are within the powers of the local Government itself. One finds that the best applicants prefer to take up permanent, if lower paid, posts in order to avoid the uncertainty of tenure in temporary posts under local Governments. I myself have lost two officers, taken by Government of India Departments within a year, just at a time when they were becoming useful and capable of independent work. Much assistance might be given by a central organisation, in touch with Universities and research centres, in securing suitable officers to fill special posts in the Provinces, either by deputation or special appointment. A somewhat grandiose scheme for a reserve of Research Chemists was put forward in the recommendations of the Chemical Service Committee. While I make no suggestion of this nature, I feel that a central organisation, controlling scholarships in Universities and research institutes, would be able to secure better recruits, and make temporary appointments considerably more attractive, than can Provincial Governments.

QUESTION 8.—IRRIGATION.—(*a*). (i) The districts of Jullundur, Hoshiarpur and Ambala are undergoing a process of progressive desiccation. The water table in Jullundur especially has fallen at a rate roughly proportional to the increase in intensity of well irrigation. The depletion of the water table can be contoured along lines which correspond with the intensity of the well irrigation. It is thus reasonable to suppose that the depletions are the result of an excessive demand now made by wells on the sub-soil reservoir. The depletion shows no signs of decrease and any scheme of extension of tube well installations can only make conditions worse, and at the same time give rise to difficult legal questions, since the owner of a powerful tube-well installation may actually rob his neighbours and throw their wells out of action. Other causes which have been suggested as contributory to this process of desiccation are the deforestation of *chos*, and geological movements at the base of the Himalayas. The only positive solution of this problem would appear to be the construction of a *kharif* channel taking Beas water. The subject is mentioned, as there appears a possibility of the establishment of proscriptive rights on Beas water by Sind and the Sutlej irrigation. This would leave a fertile *doab* waterless, although water passes on both its boundaries destined for deserts further south, which would be more profitably employed in the Punjab.

QUESTION 8.—IRRIGATION.—(*b*) The problem of water-logging has been treated at length in the Punjab Government's memorandum and is now the subject of a special inquiry. The position as shown by the knowledge we possess at present may be briefly stated as follows:—Of the water taken in at the head works of our canals, from a quarter to a third may be lost by absorption in mains and branches. This figure is based on the differences of discharge measurements taken at heads and distributary off-takes and is subject to large errors, but the maximum figure is probably not far from the mark. Of the remaining water, spread over the land in distributaries, water-courses and in the fields, a certain proportion percolates to the water table. The results of the statistical investigation which I have had in progress now enables this proportion to be fixed with some certainty. From an analysis of the fluctuation of well levels, as related to the rainfall and irrigation water received by the soil, it is found that on the average roughly one third of the water so applied percolates through the soil to raise the spring level. This is in agreement with the empirical rule adopted in America for estimating the volume of water added to the drainage by irrigation, and is also confirmed by independent lines of reasoning.

Equilibrium in an irrigated tract requires a drainage, natural or artificial, to equal this continual flow to the sub-soil water reservoir. Apparently in certain tracts, such as the Upper Bari Doab Canal, equilibrium has been established. In others there are no signs that such an equilibrium will be attained before the water table reaches the surface of the soil, whereby much valuable agricultural land will become lost to cultivation. In many tracts the water table has continued to rise steadily at a rate which agrees very reasonably with what would be expected on the basis of the figures given in the preceding paragraph. We are thus faced with the immediate problem of saving valuable land and cities threatened within a few years, as well as the ominous general trend of the water table.

QUESTION 9.—SOILS.—(*a*). (i) Measures taken to free water-logged land of surface water may not be adequate for the re-establishment of agriculture. Detailed drainage of such land, in which a drainage outfall is maintained by the Irrigation Branch, is the subject of an experiment at the Chakanwali Reclamation Farm. Mole and tile drainage is being tried with the aid of a set of Fowler Tackle. The experiment is at too early a stage to enable definite conclusions to be drawn at present.

Mr. B. H. Wilsdon.

(ii) Promising results have been obtained by the use of gypsum on alkaline lands. This treatment is most effective in cases where the soil has an alkaline reaction and has, as a result, become deflocculated and impervious. The so-called *bara* soil in the Montgomery Colony was treated by this method in 1920-21, and in conjunction with green manuring gave the most satisfactory results of any methods adopted. The experiments have, however, not been followed up satisfactorily, so that it is impossible to recommend a treatment suitable for all cases. The method will again form part of the experimental work at the Chakanwali Reclamation Farm.

QUESTION 9.—SOILS.—(*c*) The reclamation of lands extensively damaged by water-logging can, in my opinion, only be successfully undertaken by Government agency. Everything is against the individual cultivator. He himself is malaria stricken and his cattle are equally miserable and unhealthy. Successful reclamation will need power machinery and, therefore, considerable capital expenditure. It may frequently be necessary to expropriate owners of large blocks of land in order to have room to take effective measures. Re-colonisation of the reclaimed area would thus be best carried out by a special system of tenure, providing Government with a strict control of agricultural methods, in order to maintain drainage, economy of water, and thus prevent a recurrence of the evil.

RAI BAHADUR LALA WAZIR CHAND CHOPRA, B.A., M.I.C.E., M.I.E., (Ind.), F.R.S.A., Superintending Engineer, Lower Chenab East Circle, Lyallpur.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(*c*) I would strongly urge the establishment of a station for research in the matter of water-requirements of crops. Canal water is a most valuable commodity in this Province, and my feeling is that proper economy in its use is not exercised. It is only by knowing, from field experiments, the actual optimum requirements of each class of crop, that steps can be taken to economise water. Very meagre attempts have been made in the past, and all that I can recall to mind are:—

(1) Experiments on the waste of water by cultivators in wheat-growing.

(2) Experiments to determine the best number and depth of waterings for wheat crop.

} Inaugurated in 1904-05 by the late Mr. R. G. Kennedy and carried out for a few years.

(3) Some experiments in the farm attached to the Agricultural College, Lyallpur.

(4) Crop irrigation observations inaugurated in 1918, by Mr. Woods, late Chief Engineer, Punjab, and carried out for about three years.

So far no results of real lasting value or practical application have been obtained. Therefore it is necessary to establish a farm, where the number, depth, time and mode of waterings best suited to each crop may be determined and results made available to the public.

QUESTION 8.—IRRIGATION.—(*a*) (i) The larger schemes have, I believe, been mentioned by Mr. Sangster, Chief Engineer, Irrigation Works, Punjab, in his evidence before the Commission in Simla, and I need not repeat them. As Superintending Engineer, Upper Bari Doab Canal, one small scheme came

to my notice, and I wish to mention it here. The Upper Bari Doab Canal suffers from the defect that the capacity of the main line is not large enough to feed all the branches, with the result that, at times of keen demand in the *kharif* season, although there is a surplus water going in the River Ravi at Madhopur Head Works, the branches have sometimes to flow in rotation. This is the only canal in the province on which a rotational programme is observed in the *kharif* season also. The deficiency is about 500 cusecs. Both to make this good, and to take *kharif* irrigation to the *khadar* tract on the right of the Sutlej above Ganda Singh Wala (this is unirrigated at present, and lies just above the Kasur-Ferozepore Railway, which is the limit of command of the Dipalpur Canal of the Sutlej Valley Project taking off above Ganda Singh Wala weir), a rough scheme for enlarging the Salampur and Faridanagar feeders and having an independent feeder in continuation was proposed by me in 1921. By this means, and by further economy in use of water, irrigation could also be extended to the tract on either side of the Kasur Branch Lower up to the Grand Trunk Road, at present unirrigated. A feeder of about 1,000 cusecs was, therefore, proposed. The cost was estimated at about 25 lakhs, and it was shown that it would just pay its way. The engineering difficulties were not insuperable. The extra supply can be depended upon in the Ravi for at least six years out of seven. Though the scheme by itself would not bring any dividend, yet it is well worth taking up on account of its value in removing the defect of this large old canal and in bringing more area under irrigation. An additional advantage would be the opportunity the scheme would afford of examination and repairs of the first thirteen miles of the Main Line (which is its weakest part on account of so many rapids and steep slope), as the enlarged feeders would carry the winter supply for the major part of the cold weather. The scheme, however, was dropped mainly on the ground that the additional withdrawal of water from the Ravi at Madhopur would have a prejudicial effect on the Sidhnai Canal at critical times, viz., April, May, September and October. Now if the Haveli Project, which is designed to counteract the large variations in the supply of the Ravi for the Sidhnai Canal, had been carried out, this difficulty in carrying out the small local scheme on the Upper Bari Doab Canal would not have arisen. The Haveli Project is held up because of the Sindh-Punjab controversy regarding withdrawals from Punjab rivers. This case is put forward as an illustration to show how even small schemes sometimes depend for their execution on the solution of this controversy.

(iii) (1) In the unirrigated tract on either side of the Kasur Branch mentioned above, there is both *chahi* and *barani* cultivation at present, but what I would recommend for this tract is irrigation by pumping the sub-soil water by hydro-electricity. Falls to generate power exist both on the Kasur and Sobraon Branches, but as Mandi Hydro-Electric Scheme is in hand, it may be cheaper to derive power from there.

(2) In canal irrigated areas, when spring level in a tract tends to rise to within ten feet of the natural surface, steps should be taken to replace canal irrigation by irrigation from wells or by pumping from sub-soil. In this way any rise that may take place on account of proximity of canals will be counteracted, and further rise of spring level would be checked. In fact, after a fall of a few feet an equilibrium will be established, depending on the infiltration head needed to work the wells or pumps.

Such a thing has been tried at Amritsar and has succeeded. The area round Amritsar had become water-logged, and the heavy rains of 1908 brought about a serious condition of affairs, and mortality from malaria reached the appalling figure of a plague epidemic. The Local Government's attention was drawn to this serious state of affairs, and as a result fourteen tube wells were sunk and worked by the Hydro-electric Power Station at the Grand Trunk Road fall on the Main Line Lower of the Upper Bari Doab Canal. *Pari passu* with this, the surface drainage was improved, and two miles of the canal upstream of Amritsar were lined. The lining did not

prove effective, as the cement slurry broke away, and the surface drainage, although it reduced percolation into the sub-soil, could not directly act on the spring level. The irrigation from the canal was reduced by the extent the pumps supplied, and any amelioration of conditions should in the main be attributed to pumping and replacement of canal irrigation by pump-irrigation. The Hydro-electric pumping installation was first put into service in the year 1916, but the whole of the pumping sets were not in use until 1917. Mr. John Ashford, then Superintendent, Central Workshops Division, Amritsar, who installed the scheme, showed in a note, dated December, 1922, that the spring level in the region served by pumps had fallen from 5 to 7·7 feet—say an average of 6 feet. His method of observation was to record the lowest spring level in the year at each pumping station, so as to be free from the effects of monsoon, the water-table being observed when the pumps were stopped from working for the previous 24 hours. In the Punjab Irrigation Branch there is a system in vogue of recording spring levels on selected lines of wells every June and October. One of these wells—unfortunately one and not more—happened to be in this Amritsar pumping region. By comparing the spring levels that obtained in this well before and after the pumping installation, I as Superintending Engineer, in my review of Mr. Ashford's note, showed independently that this well had a fall in spring level of 3 to 4 feet. It may be said that in five years the spring level was lowered by an average of 5 feet, and unhealthy conditions round Amritsar have ceased to be.

One real remedy to relieve and prevent water-logging, therefore, is pumping from the sub-soil; the other, of course, being surface drainage, to which I will revert in reply to question 9 (a) (i). I understand Mr. T. A. Miller Brownlie is taking up experimental hydro-electric pumping at Sagar, deriving his power from one of the canal falls. I welcome this attempt on the part of the Agricultural Department, Punjab; but I am strongly of opinion that in future such schemes should be in the hands of the Irrigation Department.

On the Lower Chenab Canal the whole of the commanded area on the left of the Main Line and of the Jhang Branch from Chenanwan to Chiniot should really be so treated, any suitable area between the limit of command and Chenab River also being included in the scheme. For this tract power can be had from the Mandi Hydro-electric Scheme, and reference to the Chief Engineer, Hydro-electric Branch, elicited the information that this area can be supplied with power from the first stage of the Mandi Scheme sometime in the year 1930. The same should be the case with the tract between the Gugera and Mian Ali Branches, say, up to Lahore-Pindi-Bhatian Road, and with similar tracts on the Upper Chenab Canal. These schemes will include the water-logged areas in those tracts. When water rises to within 4 feet of natural surface, and at many places it has so risen, it has a detrimental effect on the crops, and I have fixed 10 feet as the limit when canal irrigation should be replaced by pump-irrigation.

The canal water thus set free can be used for extension of irrigation elsewhere.

The difficulties in the way of such schemes are threefold:—

(1) *Administrative.*—The people are not willing to give up canal irrigation, and in this they get the support of the District Officers. The Irrigation Department has a policy of converting perennial channels into *kharif* ones when spring level rises high, and even this partial restriction of irrigation is resisted by the people. I quote two instances on the Lower Chenab Canal:—

(*a*) On the Chhani Distributary the spring level had by 1922 risen to about 6 feet below the natural surface, and it was strongly urged by the Irrigation Department that it be converted into a *kharif* channel; but in view of the opinion of the Deputy Commissioner

and the opposition of the zamindars the idea of the conversion was abandoned. Thus, in spite of such high spring level, the Chhani continued to be a perennial channel.

(*b*) In the case of the upper reach of the Hafizabad Distributary, where irrigation was once abandoned on account of water-logging, and where some improvement has taken place as a result of our seepage drains, restoration of irrigation was contemplated on a *kharif* basis; but as a matter of fact restoration of perennial irrigation has been sanctioned. The spring level now is 7 to 11 feet.

(2) *Higher rates.*—The lift-water will naturally be more costly. Exact figures are not known, but the cost per acre would not be less than Rs.10 per acre. In the case of Jalalpur Hydro-electric Project, where water is to be lifted from an open channel—namely, the Jhelum River—it is seen that if the average occupier's rate is taken as Rs.7-8-0 per acre, the Project is just productive if credit is taken for the interest on realisation from sales of Crown lands. So in cases where water is to be pumped from sub-soil, and where no sale of Crown lands is involved, a cost of Rs.10 per acre is not high. In order that the pumping installation may pay, the consumer may have to pay a rate of Rs.12 to Rs.15 per acre, compared to the present canal rate of rather less than Rs.5 per acre.

(3) *Technical.*—There being not many examples in the Province, the technical knowledge is wanting, and there is a certain degree of shyness in taking up lift irrigation from the sub-soil. The first example in the Province was the Hydro-electric pumping at Amritsar, mentioned above. Being the first attempt, the cost data cannot be taken as a true guide. Then the yield of the wells deteriorated, due partly to less infiltration head caused by fall in spring level and partly to the choking up of the strainers. The next lead was given by the Renala Hydro-electric Scheme of Sir Ganga Ram, but here too the water is lifted from an open channel.

These difficulties should be overcome in course of time, and there should be no hesitation to work out schemes against the introduction of power from the Mandi Scheme.

3. This also disposes of Question 9 (c) in so far as it relates to such irrigated lands as have gone out of cultivation on account of water-logging.

QUESTION 8.—IRRIGATION.—(*b*) The present method of distributing water to cultivators consists in taking Government distributary channels from canals or branches, and giving outlets of manageable size to cultivators' chaks, the water to their fields being taken by water-courses dug by themselves or at their cost. This form of distribution is all right, but there are aspects of it which need examination.

(1) Sufficient economy in the use of water is not exercised. In the case of outlets, it results from two causes:—

(*a*) The full supply factor taken at the outlet-head is really too low. On the Lower Chenab Canal, for instance, till recently it was 250 acres per cusec, and is now 264. But the actual figure is in the neighbourhood of 350. I enclose as Appendix I a statement of full supply factor at outlet-head observed on the Awagat Distributary of the Lower Chenab Canal, which happens to be at the centre of the perennial area on this one of the largest irrigation systems in the world. Very accurate daily discharges of outlets and of the Distributary at suitable control points are being observed for the last four years. The Distributary has been taking full supply at head of 60 to 62 cusecs, the outlets taking 52 to 58 cusecs, the difference being loss in absorption. The full supply factor varies from 340 to 367, average being 355. Now on a 250 basis, the irrigation on this canal in round figures is 2,450,000 acres per

annum. On a 350 basis it would become 3,450,000, which is practically equal to the gross area commanded, i.e., 3,400,000. Thus with proper exercise of economy, every acre in the commanded area could be brought under irrigation. In this age of linked canals the water saved from one canal can be utilized in other canals, and no compunction should be felt in cutting down water—of course the process should be gradual.

(*b*) The mode of assessment is such that there is no incentive to economy of water. It is made by actual measurement of crop area, rate being so much per acre matured. If the system were volumetric, or by leases, the consumer would make every endeavour to make his water do as much irrigation as possible. The volumetric system has recently been introduced, but only a few large landholders can take advantage of it. The small holder cannot, and therefore I am in favour of a system of irrigation by leases on a co-operative basis. I cannot do better than reproduce* in the main my note, dated 1919, written for the benefit of the first Board of Agriculture in the Punjab of which I was selected a member. I wrote this note as a result of my observation of the system on the Sone Canals in Bihar and of my further study of the subject. The arguments still hold good, and I draw attention to the concluding part of the note (paragraph 12). By this method in course of time economy of water would result, and the canal *patwari* agency be abolished. It will not be a wonder if, in course of time, the figure 350 given in (1) above may rise to 400.

(2) As a corollary to what has been said above, I am strongly of opinion that comparatively high duties and full supply factors should be taken on our new canals. In the case of Sukkur Barrage, for instance, in the Project of 1920, the full supply factor for rice at canal head was taken as 39, and Dr. Summers, late Chief Engineer in Sind, considered it as too high, and severely criticised the adoption of this figure by Sir Thomas Ward. On examination of the problem I found that Dr. Summers's adverse criticism was not justified. The proper point to fix full supply factor is at distributary head, and I am of opinion that for Sukkur Barrage Distributaries the full supply factor at the distributary head should not be less than 50; I am prepared to take it as 60. In this connection I refer to Punjab Irrigation Branch Paper Class B, No. 10, being a note† by me dated 20th March, 1925, on the Full Supply Factor for rice in Sind.

(3) Even on the basis of crop requirements as they are understood by the zamindar at present, and his method is wasteful, I find that a good deal of water is wasted in the pre-monsoon hot weather months of April, May and June. I enclose as Appendix III my note on the subject, taking Kasur Branch Lower of the Upper Bari Doab Canal as an example. At the end of the note is a curve which shows that whether the year be normal, wet or dry, the supplies run in April, May and June are above even the wasteful crop requirements of zamindars. It will be a useful thing to conserve these supplies, and the question as suggested in last paragraph of the note should be considered either by a Committee or by the Discharge Division of the Irrigation Branch. It will also be observed on this curve that the supplies run in winter are below the requirements curve, and since crops are all matured as a matter of fact, this incidentally shows that requirements of water as understood by the zamindar are wasteful.

II. There have been no regular methods employed so far to prevent loss by absorption in the soil. In the past there have been some spasmodic attempts at lining certain lengths of canal on the Upper Bari Doab Canal (described under Question 8 (a) (iii)) and the Lower Chenab Canal. Only now on the Sutlej Valley Project has the Main Line Bikaner Canal been lined for its entire length of about 80 miles. Surface evaporation is hard to prevent; the policy of having plantations along canals and distributaries

* Appendix II. † Not printed.

indirectly helps in reducing evaporation. In the case of water-courses, by keeping their capacity beteween one and two cusecs, their multiplicity is saved and thus absorption reduced. In the Research station for water requirements suggested in reply to Question 1 (*c*), experiments in lining distributary and water-courses should also be carried out.

III. The best form of outlet for distribution of water at the tails of distributaries is the tail-cluster with standing-wave in each opening. The discharge depending on the gauge upstream, by keeping the floors of all openings at the same level, the discharge is proportional to the width of each opening. This device has been very successful in equitable and economical distribution of water at tails.

QUESTION 9.—SOILS.—(*a*) (i) The irrigated Punjab is an alluvial tract, and where canal irrigation prevails in the province, it is necessary to have an efficient system of surface drains, so that minimum of soakage takes place from rainfall. Natural drains in flat country do not have a graded bed, but because of intermittent flow, they become a series of alternate ponds and rapids, and water left in the ponds after the flood is over mostly soaks into the sub-soil. This becomes very apparent on the Upper Bari Doab Canal, where through long irrigation and deep rivers on either side, especially the Beas on the left, an equilibrium is reached for the conditions of irrigation and normal rainfall. In years of abnormal monsoon rainfall, the central part of the Doab shows signs of water-logging. Ordinarily the monsoon ceases about 15th September, but in 1917 there was about 5 or 6 inches rainfall at the end of September and a like figure at the end of October, and an extraordinary rise in spring level took place in the central part of the Doab. This was due to ungraded and restricted drainages. A special Drainage Division was opened for two years to work out the drainage schemes on this Doab. The Hudiara Nala Scheme is in hand now at a heavy cost, and other principal drainages will be taken up later. This policy should be adopted throughout the Province.

(ii) The unculturable land, if it happens to be in a tract which is subject to inundation from hill torrents or rivers, such as the *kallar* area in the Deg Valley and on the left bank of the Ravi, one method of making it fertile is to make the flood-spill water to stand on the lands by means of suitable bunds with sluices, so that the silt in the water may be deposited and then clear water drained off. This fine silt deposit will make the land fertile in course of years.

(iii) The erosion of the surface soil by flood-water takes place only if the slope of the country is steep. The erosion can be saved by terracing the land. This is very largely practised in hills, and in the sub-montane parts of the plains.

(*c*) Please see last paragraph (3) of reply to Question 8 (*a*) (iii).

QUESTION 10.—FERTILISERS.—(*a*) and (*f*) and 19.—FORESTS.—(*b*) The possibility of greater use of natural manures lies in the direction of using cow-dung and green manure. It is necessary that fuel supply in villages should be improved so that wood fuel is cheap. When the area under cultivation was not so great as at present, the fuel used was partly cow-dung and partly brushwood and its roots from the jungle. Now the latter is not possible, and it is necessary to encourage plantations in village common land. The water in irrigated tracts should be given free, and villagers should co-operate to rear up the plantation and have a working plan under the guidance of the Forest Department, the service being rendered free. In this way it may be possible to use less of cow-dung as fuel and use it mostly as manure.

As regards green manure, field demonstration should be taken to peoples' doors; and the recently introduced policy of the Irrigation Department, of remitting water-rate on hemp, indigo and *guara* sown after February and

ploughed as green manure before 15th September should be persisted in. People have not taken much advantage of this concession yet, but a beginning has been made, and there is no doubt that green manuring will become popular in course of time. Propaganda by the Department of Agriculture is needed. In Bihar there is a system of green manuring paddy lands. By the end of October, when the plants are in flower, a secondary crop (called *pairа* crop) of gram, linseed or *keshari* (a kind of pea) is generally sown in rice fields. Water is taken into the plots and then the seeds are sown broad-cast; the water is then allowed to remain in the fields for about 30 hours and then drained off. The roots and remains of this *pairа* crop act as a green manure.

There is a similar practice in Egypt. Berseem (a variety of clover) is sown in the standing paddy as soon as the water is finally drawn off the crop, ten days before harvest. The seed falling on the soft mud germinates at once, and by the time the land is dry enough to harvest the paddy, the clover is one or two inches high and will not be hurt by being trampled on. It soon springs up above the stubble, and requires irrigating once or twice before it is fit to cut, in six weeks' time from sowing. In Egypt this clover last three months, and is cut three or four times, forming an invaluable fodder for horses and cattle. Then it is ploughed in green, giving to the soil rich nitrogenous manure stored in root and leaf.

These examples are given to show that same form of green manuring is practised by people themselves elsewhere, and with proper education and facilities it may come into vogue in the Punjab.

QUESTION 11.—CROPS.—(*a*) (i) I have made a special study of the rice crop, and am strongly of opinion that produce per acre of rice in irrigated tracts can be considerably increased by alternately irrigating and draining rice. I observed one system of draining in Bihar, and from further study of the subject I learnt that it is practised in other parts of the world also. The system of draining should be such as to ensure deposit of silt usually present in canal water. Thus water when applied should be allowed to stand till the silt deposits, and the clear water should then be drained off. The soil should then be allowed to dry till small cracks appear in it to aerate the roots. Water should then be applied again and the same process repeated. I carried out an experiment myself in 1916, and on the whole found that paddy so treated yields about 33 per cent. better produce. I enclose as Appendix IV my note on "Draining of rice."

Rice requires a large quantity of water to mature it, and for this reason should have an experimental and demonstration farm by itself, in a rice-growing region. On my return from Bihar tour in 1915, I had suggested to the Chief Engineer that such a farm might with advantage be established on the Raya Branch Upper Chenab Canal, which is in the main a rice irrigating channel. I am glad now that one has been established under the auspices of the Agricultural Department. Strange as the suggestion may appear, I would recommend that this farm should be in charge of the Irrigation Department, at any rate to begin with. A sound knowledge of agriculture cannot be divorced from the education of the present day Irrigation Engineer, and it will be not unnatural if the farm for rice, which so much depends on water, is placed under his charge. I think an Assistant Engineer (attached to the Division) should be in charge, helped by a subordinate and a *zilladar* who has received his education at the Lyallpur Agricultural College. The work should be carried out with the advice of the Deputy Director of this part, who should inspect the farm and record his remarks in the Log Book. Thus there will be co-operation between Irrigation and Agricultural Departments, which is a very necessary thing for the Punjab now. Later on, if necessary, the farm may be transferred to the Agricultural Department.

I understand that the main object of this farm is to have good seeds and evolve new varieties. This is not enough, but all matters concerning rice should be carefully dealt with. Seed selection is a very important matter indeed, and it has not received any real attention in the Punjab. But "it is important that the grain intended for sowing should be carefully selected with a view to securing seed of high germinative power, true to type, and free from red grains. Light grains which usually fail to germinate may be eliminated—by winnowing or, more effectively, by floating off in salt water, the latter being the method practised in Japan. To keep the grain true to type, it is advisable to collect separately, previous to harvest, the finest heads from the best yielding plants of the particular varieties, and to reserve the grain obtained from these for sowing purposes. The crop obtained from seeds so selected should be subjected to a similar process of selection during subsequent harvests until the type has become "fixed" . . . . . The elimination of red grains is important, if the crop is intended for export, as the presence of red grain in samples of milled "white" rice lowers the commercial value of the latter considerably, and there are no methods of milling by which red grains can be separated from white" . . . . (a) In Ceylon "seed selected" in the Japanese method "and sown less thickly has been found to give a larger outturn per acre than unselected seed" (b) Useful work in this direction is being done in Madras, Bombay, Central Provinces, Bengal and Burma, and it is necessary to do the same in the Punjab." Besides seed selection, and evolving new varieties, draining and green-manuring discussed above, the following matters should also receive attention on the farm:—

(1) *Seedlings.*—Under this head come the best mode and time of sowing seed-beds, the age, height and rate at which the seedling should be transplanted. In Madras the seedlings are planted when they are three to six weeks old according to the varieties, their height being one to one and a half feet. In Raipur farm the 1916-17 experiments on the *gurmatia* variety of rice showed that where one seedling is planted per hole, the best outturn was from seedlings five weeks' old, while two seedlings per hole six weeks' old gave the largest outturn. It should be seen by experiments what is the best for the Punjab rices. With regard to seedling rate in transplanting, the usual practice is to put a large number of seedlings in one hole. This results in waste of seed and also in less produce per acre. Recent experiments in Madras, Bengal and even Japan have shown that single seedling plantation gives very good results. The Madras experiments show that if seed has been sparsely sown in the seed-bed, strong seedlings are obtained, and equal yields are got by transplanting the seedlings singly. "In Godavari, Tanjore and other southern districts, the usual seed rate was about 100 to 150 lbs. per acre, and bunches of from five to eight and even 16 plants were transplanted. By single seedling transplanting the rate was reduced to 20 lbs., resulting in a saving of about Rs.3 an acre in seed alone without affecting the outturn. The system has been very widely taken up in Tanjore and other southern districts, and it is estimated that the profit arising therefrom must be worth about 10 lakhs of rupees a year; (c) "An experiment conducted at Nugawela in Ceylon (d) in 1914-15 with a seven-month crop indicated three seedlings per hole as giving the best outturn, and two seedlings per hole gave next best results. The experiments carried out at Raipur station showed that where close planting is practised one seedling per hole gives the largest outturn; where planting at medium

(a) Bulletin of the Imperial Institute Vol. XI, No. 4, October—December, 1913.
(b) Tropical Agriculturist, Ceylon, June, 1915.
(c) Report on the Progress of Agriculture in India.
(d) Tropical Agriculturist, June, 1915.

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widths, *i.e.*, 6 inches, is practised 2 to 3 seedlings per hole do better than singles, while with wide planting, *i.e.*, 9 inches apart, threes and bunches have done best. That a low seedling rate is really good is further shown by the fact that "in Egypt only half a bushel is sown per acre, and the yield is from 60 to 150 bushels per acre. In Ceylon, two bushels are sown and 40 or 50 is the average reaped from the best fields." (a) Thus, there is an optimum rate for seedlings, and this should be investigated for different varieties in the Punjab.

(2) *Transplanting.*—There is no point in having any broadcast rice in the irrigated parts of the Punjab, and yet it is practised a good deal. One thing that the farm should do is to popularise transplanting by demonstration, as the excess in outturn far exceeds the extra initial cost. "The physiological factors involved in transplantation are somewhat obscure, but the conclusion at present arrived at after a number of experiments is to the effect that transplantation acts in a way like root pruning, the injury to the root system stimulating the growth of the sub-aerial portion and resulting in increased tillering. The root system of the transplanted rice is developed from the lower nodes of the stem, the first or seedling root system dying completely. In fact a series of experiments showed that amputation of root system of the seedlings did not interfere with the development of the transplanted plants." (b) In Central Provinces is has been shown that the transplanted paddy on the average pays about Rs.15 per acre more than a broadcast paddy, and as a result of Dr. Clouston's efforts a large area in Chhattisgarh Division is transplanted now. According to Mr. E. J. Butler, Imperial Mycologist, that worst disease for rice called *ufra* does not attack transplanted rice. (c) Zamindars in the irrigated Punjab should, therefore, be instructed not to sow any broad-cast rice.

(3) *Hoeing, weeding and cultivation during crop.*—All this requires systematising.

(4) *Manure other than green manures.*—It will be useful to determine the best manures for local rices, as the kind of manure to be applied depends to a large extent on local circumstances as regards availability and cost of transport, and to the peculiarities of the soils to be dealt with. Bonemeal has in many Provinces given good results, and as bones are available in the Province it will be a good thing if local crushing is arranged for, and the present export, which is a great agricultural loss to the country, stopped. Artificial manures do not suit rice on account of their solubility in water which is generally present on rice fields. Experiments in Coimbatore, Madras, have shown that "bulky" organic manures applied to rice fields give better results than manures of similar value but containing little organic matter" (d).

(5) *Duty of water.*—This is a very important subject, and very vitally concerns the Irrigation Department. This figure is uncertain. The Raya branch itself is designed on a duty of 80 at distributory head. In the Sone Canals it varies from 68 to 48. The usual figure believed in the Punjab is 65. King gives a range of duty from 55 to 66—actual figures given by him from various sources being 25, 28, 30, 50, 55 and 66. Experiments made by Mr. Balfour in Ceylon led him to the conclusion that on average paddy lands about 16 inches of water is required for the first month, and about 12 inches for succeeding months of irrigation. For the proposed farm in the Raya Division, the direct measurement of

(a) Tropical Agriculturist, June, 1915.
(b) Classification of rice in the Central Provinces, by Mr. R. J. D. Graham.
(c) Pusa Bulletin No. 34, "Disease of Rice."
(d) Bulletin of the Imperial Institute, London, Vol. 11, No. 4.

water and rainfall over a series of years will give the average delta in the field, and from this basis it will be possible to work out the duty in this Division, as rice irrigation only is done here.

(6) *Diseases of rice.*—Rice suffers from a variety of pests and diseases. Investigations have been made in Pusa, and will be found in Bulletin No. 34 named "Diseases of Rice" by Dr. Butler. A leaflet showing pictures of different pests is issued from Lyallpur College also. The article in the Bulletin of the Imperial Institute gives a good description of rice pests and diseases and of their treatments. The farm, by correspondence with Pusa Institute and Lyallpur College, can understand and deal with local pests and diseases.

7. *Varieties of rice.*—Varieties of rice are legion. In Bihar during my short stay I collected samples of about 30 rices. In Central Provinces, Mr. Graham collected as many as 670 rices having different local names, although each does not necessarily represent a distinct variety. In the Punjab we have our own varieties like *sathi, mushkan, bara,* etc. The classification is done on three different bases, namely:—

(1) Habit of growth and cultural requirements.
(2) Characters of grain.
(3) Period of growth, i.e., early and late varieties.

It will be a useful work if the farm classifies Punjab rices on a sound basis. Another very important work that can be done at the farm is testing the local varieties and propagating pure strains of the most promising ones, as is done at the Raipur farm for Central Provinces rices.

(8) "*Flood*" or "*deep-water*" rice.—Another thing that may with advantage be done under the management of the farm is the introduction of the "flood" or "deep-water" variety of rice in inundated parts in the neighbourhood. One such place is the eastern part of Rakh Mari, which is inundated on account of the passage of the Deg Diversion through it; and another is the land between the Mast Chak Bund and the Ravi river. The variety is grown in Siam, Burma and Bengal. As the idea is new for this province, I do not need an excuse for quoting in full what little has come to my knowledge, in order to stimulate interest in this new thing, so that it may be seen if some of the inundated area which goes without any crop in floods may not with advantage be employed for the growth of this rice. There are only four short quotations, namely:—

(i) from the book called "Siam—A Handbook of Practical Commercial and Political Information, by Graham," pages 302-303.

> "Again, in many parts of the country, the land on which rice is grown is liable to floods of greatly varying severity. Here the ordinary rice-plant would frequently be destroyed and a variety is therefore used which has been evolved in the course of centuries of selection. The variety grows at first as ordinary rice, but when the floods come its growth is accelerated to keep pace with the rise of water. The straw, large and light, acts as a float and keeps the head of the plant above water, and as the flood slowly subsides, lies on the surface throwing out at the nodes lateral shoots that terminate in ears and fibrous rootlets, which draw from the water the additional nourishment demanded by the luxuriously growing plant, which the original roots in the soil cannot supply. Thus a crop is secured, however severe the flood may be, though the resultant grain, owing doubtless to the rank growth of the plant, is small and inferior in quality to that produced on irrigable and drainable lands."

(ii) From the Bulletin of the Imperial Institute, London, Volume XI, No. 4, page 637:—

> ". . . The term 'giant rice' is proposed by Kikkawa for certain forms that grow beyond the normal height of ordinary rice, which is usually about 3 feet and seldom exceeds 6 feet. In Siam and certain parts of India the stems of the 'giant rice' have been known to reach a length of from 10 to 15 feet. As they seem to possess the property of growing taller as the water rises, these 'giant rices' have their value in districts liable to flooding, and where the depth of the water cannot be controlled."

(iii) From the Progress Report of the Ceylon Agricultural Society in the "Tropical Agriculturist," Ceylon, for June 15, page 380:—

> "Mr. C. D. A. Gunawardena forwards a report on the cultivation of '*yahaing*' and '*shangale*' paddy from Burma. These varieties are known to be water-resisting and were cultivated on fields apt to be flooded. '*Yahaing*' withstood inundation when ears were ripening. The paddy is a three months variety and was broadcasted on 17th November. It went under water from 27th November to 1st December, 6th-9th December, 1st-5th January, and 16th-18th February. The yield secured was 45 bushels per acre. '*shangale*' failed to germinate satisfactorily."

(iv) From Pusa Bulletin No. 34, "Diseases of Rice" by Mr. E. J. Butler, Imperial Mycologist, page 3:—

> "The deep water varieties are coarse and withstand flooding to a remarkable extent, being said to grow as much as 9 inches in 24 hours and to reach a length sometimes of 20 feet. . . . The deep water rices are grown in the lowest lands, and in some places, where the inundation is early, have to be sown in February. They keep pace with the rise of water and at harvest only the ears and 1 to 1½ feet of stalk are cut, the rest, often many feet in length, being left as stubble. . . ."

The author is speaking of the Lower Bengal Districts of Noakhali, Tippera and Dacca.

QUESTION 22.—CO-OPERATION.—(*c*) I would say an emphatic yes. In co-operative irrigation I fully agree with the opinion expressed by Sir Henry Harrison given in the note on co-operative irrigation attached as Appendix II to Question 8 (*b*).

I reproduce it here to bring it pointedly to notice:—

> ". . . I submit that, if not at once, eventually some system of village government must be devised and sanctioned by law, enabling a large majority of candidates for water for a certain area to coerce a small minority into accepting it. I energetically maintain, then, that we must be careful to preserve the system of leasing in compact areas, that leasing in compact areas involves as a consequence that the tenants of such areas should be vested with the powers which all communities have of overruling the objections of an obstructive minority, more especially when the minority as a rule desire the water but hope, and too often hope rightly, that by holding out they will obtain some at least of its benefits without payment."

QUESTION 26.—STATISTICS.—(*b*) I would strongly urge introduction of uniformity in weights and measures in the country. There are practical difficulties in the way of this reform, but the advantages, which need not be dilated upon, far outweigh the effort required to overcome these difficulties, and persistent attempt should be made to bring about the reform, even though gradually. For area the units should be the English acre

and its decimals, and for weights the Indian maund and seers (maund = 82 2/7 lb.). For assessment of canal dues, a system of recording and assessing in acres and decimals can be brought about easily. In the accompanying note (Appendix V)* it has been shown how different land measures in the Punjab can, with the help of simple conversion tables and simple mental arithmetical formulæ, lend themselves to assessing canal rates on an "acres-and-decimal" system. I would advocate its adoption as a first step towards uniformity of measures in canal administration.

APPENDIX I.

RELATING TO QUESTION 8.—IRRIGATION.—(*b*) *Statement showing full supply factors at outlet heads on Awagat Distributary, Lower Chenab Canal.*

Season	Cusec days at outlet heads.	Days of flow.	Average discharge per day in cusecs.	Area assessed in acres.	Full supply factor per cusec.	
Kharif 1922	7,029	134	52·5	6,813	129	367
Rabi 1922–23 ...	7,272	136	53·5	12,729	238	
Kharif 1923	7,257	132	55·0	6,932	122	351
Rabi 1923–24 ...	7,148	131	54·6	12,509	229	
Kharif 1924	8,314	156	53·3	7,484	140	340
Rabi 1924–25... ...	7,473	128	58·2	11,669	200	
Kharif 1925	8,653	165	52·5	8,136	155	361
Rabi 1925–26 ...	6,450	118	54·6	11,249	206	

Average 355 acres to a cusec.

APPENDIX II.

RELATING TO QUESTION 8.—IRRIGATION.—(*b*) *Note on a "System of Irrigation by leases on a co-operative basis."*

During my visit to the Sone Canals in Bihar in 1915 I had occasion to observe the system of irrigation by leases in vogue there. Further study of the subject, and observation of the marked progress that is being made in the matter of co-operation movements in the country, lead me to think that time is come when a real start should be made of irrigation by leases in the Punjab. It may be said that the experiment on the Shahkot Distributary, Lower Chenab Canal, did not prove a success; but it must be remembered that the experiment synchronised with the substitution of modules in place of outlets, resulting in silt trouble in the Distributary, and that the *patwari* agency was kept oon for statistical purposes, resulting in a certain suspicion in zamindars' minds; then the period was not sufficiently long to judge results. A further attempt is therefore necessary.

2. It will be a useful thing to give a history and description of the Bihar system. Irrigation first started on the Sone Canals in 1875-76, and in 1874 it became necesary to consider what revenue system be followed on these canals. In *kharif* the bulk of irrigation was rice, and the rainfall in Bihar is so favourable that a good deal of rice was matured on rain. In spite of the vagaries of the Indian monsoon, the average rainfall in Bihar is about 50 inches, of which about 45 inches fall in the rice season of June to October. Although there are sometimes long breaks, a perusal of

* Not printed.

Rai Bahadur Lala Wazir Chand Chopra.

the rainfall register of the Arrah Division showed me that the number of rainy days in July and August is much larger than in the Punjab. Thus the rainfall is both copious and better distributed. During breaks in rains and for the periods immediately following the rains, the irrigation was in pre-canal days effected from shallow reservoirs or *aharas* which were formed by throwing earthen embankments across the country drainages with two sides running up the slope. Such *bunds* across drainages are not unfamiliar to people of the Sialkot District, which is traversed by the Aik, Deg and Satrah *nalas*, and, which being submontane has important drainage lines and fairly good rainfall. Outside the commanded area of the Sone Canals this system of irrigation is still practiced. Thus in the Eastern Bihar district of Gaya about half the cultivated area of the district is watered from these *aharas* and *pains* (a sort of inundation channels from streams) made by private agency. This favourable condition is reflected in the very low water-rate for rice; to begin with it was fixed at Re. 1-8-0 per acre, and went on gradually rising until in 1904 it was fixed at Rs. 3 per acre for long leases, as compared with Rs. 6-4-0 and 7-8-0 per acre in the Punjab. It is further shown by the fact that a system of crop experiments was introduced and is still in vogue determining the yields of crops cultivated with the assistance of canal water, as compared with crops cultivated without this aid, and to rouse the interest of cultivators it is enjoined that these experiments should be conducted as publicly as possible. These, then, were the considerations when the irrigation on Sone Canals system came to be introduced. At that time there were two systems to guide, (1) the Upper India system, (2) the Bengal system (Orissa and Midnapore Canals). While contrasting the two systems in 1874, Lieutenant Ottley, R.E. (later Sir John Ottley, K.C.I.E.) expressed himself thus:—

"In Northern India a cultivator who desires to irrigate applies not so much for *water* as for either a share in an existing watercourse or for an entirely new watercourse. The *sunnud* once issued, he is at liberty, subject to comparatively minor restrictions, to water when he likes, where he likes, and what he likes. He can, if it so pleases him, refrain from irrigating if he sees a chance of rain; and in this case he is charged no water rate.

"In Bengal, on the other hand, he is compelled to state formally for *every crop* the area he wishes to irrigate, and above all he must, if he would avoid paying a heavier rate make up his mind before a certain and that a very early date, *i.e.*, at least six weeks before the irrigation is actually required. It must be apparent to all that this procedure must naturally tend to deter the cultivator from taking water, as weighty formalities have to be gone through previous to *every crop*, and not, as in Northern India once for all."

3. Although Lieutenant Ottley saw the difficulty that in ordinary years the land would be practically under water when it would be almost impossible to distinguish between canal and rain irrigation, he proposed that Northern India Canal Act, VIII of 1873, should be made applicable to the Sone Canals, with slight modifications. The rules required that cultivators should apply for permits to irrigate specified areas, but that the charge should be on the area found by *measurement* to have been actually irrigated. This was a sort of compromise betwen the Punjab and Bengal systems. This method though suitable for lands entirely dependent on artificial irrigation such as sugarcane or cold weather crops, or on canal systems of Northern India, proved quite unsuitable for rice crops on a large scale during the monsoon, when irrigation is only a help to the rainfall. This mixture of rain and canal water led to confusion. Supply was given from the canal as in Upper India and the officers "hunted the

mixture of canal and rain water all over the country." Mr. Inglis in his book on "Canals and Flood Embankments of Bengal" says that he remembers an "Assistant Engineer who used to take samples of the water in the fields, which he stated, he could determine to be either rain or canal water by sight, taste and smell."

Rates and rules for working on the Sone Canals were revised from time to time—in 1878, 1879, 1880, 1881, 1888 (on the recommendation of a committee of 1887 presided over by Mr. (later Sir Henry) Cotton, 1891, 1896, 1900, 1901, 1904—and in course of time was evolved the present system of irrigating on leases and dividing the period of the year into three seasons of *kharif*, *rabi* and the "hot weather." The leases are of two descriptions—long and season leases. Long leases are for a term of years—previously they were for three or five years, but now the tendency is to make all long leases, seven year ones for supply from 26th June to 25th March, that is a full year except the hot weather. In *kharif* there are both classes of leases, and in *rabi* and hot weather there are season leases only. For *kharif* the water-rates are levied on the area of the block, and no measurements of the area actually irrigated is done, whether it is a long lease or season lease, sufficient water being allowed to do cent. per cent. irrigation in the block. The rate for long lease is Rs. 3 and for season *kharif* lease Rs. 4 per acre. For *rabi* and hot weather leases, the water-rates are levied on the area actually irrigated, the applications only approximately specifying the areas of land for which water is required. For sugarcane in long leased area additional rate is charged by measurement in hot weather. Permits for single watering, &c., are also essential, but that does not concern our subject.

4. It will be thus seen, that as a result of forty years' experience, the present system is evolved. The detailed rules can be seen in the printed book "Some Canal Rules."

5. It may be noted, that while the system has succeeded in Bihar, it did not attain success on the Western and Eastern Jumna Canals. On the Western Jumna in early years, selling water by contract on leases up to thirty years was started, the land-owner agreeing to pay a fixed price for a water course head with a given area of opening. But in this time various changes and improvements were going on, and the system was abandoned. On the Eastern Jumna Canal about 1867 a great many three-years' leases were entered on, and the system was readily accepted by the zamindars, but at the expiry of the first lease, people declined to renew them owing to the fact that people did not possess that co-operation, which is necessary to equitably distribute the water amongst themselves or determine the share of revenue to be paid by each. Thus it appears, that the failure of the two Jumna Canals was from want of persistence in the system, while the success in Bihar and Bengal is due to such persistence. There was no co-operation amongst the people before, but the system has brought in the necessary co-operation. The state of affairs in the early days can be judged from the following quotation from the report of Mr. (later Sir Henry) Harrison, at that time Collector of Midnapore:—

> "Frequently leases have had to be withheld because other ryots will not join in them, still more frequently they have had to be postponed while the Government Officer in an undignified manner dances attendance on the recusant ryots and endeavours by a mixture of persuasion and argument, to induce them to unite in a lease which cannot be accepted otherwise. I submit that, if not at once, eventually some system of village government must be devised and sanctioned by law enabling a large majority of candidates for water for a certain area to coerce a small minority into accepting it. I energetically maintain then, that we must be careful to preserve the system of leasing compact areas, that leasing in compact areas involves as a consequence

> that the tenants of such areas should be vested with the power which all communities have of over-ruling the objections of an obstructive minority more especially when the minority as a rule desire the water, but hope and too often hope rightly that by holding out they will obtain some at least of its benefits without payment."

6. Compare this with the following extract from an article by Mr. W. A. Inglis (retired Chief Engineer, Bengal), entitled "Looking Back" in "Indian Engineering," dated 23rd October, 1909, and the value of perseverance will be at once understood:—

> "On the Sone Canals . . . the demand for leases is greater than we are able to comply with, and it is easy to decline applications for lands which require more than the usual quantity of water. The great advantage of the settled leases is that we know beforehand the volume of water required at each outlet and for each distributary. In the earlier days, with indefinite leases and unregulated outlets, the most heroic efforts were required at times of urgent demand to get the water to the land near the ends of distributaries. Now it is mainly a question of keeping up the level of the river in the pool above the weir, though of course, it is still very necessary to constantly inspect the distributaries to see that the pre-arranged rotation is kept and that the flow is not obstructed or interfered with. The construction of outlets, regulated in accordance with the area to be irrigated and with the discharge capacity of the distributary, and the methodical rotation of supply from the Main Canal to distributaries has done much to facilitate the distribution of the water. It is most interesting to study the efficiency of these arrangements. There is a great pleasure in riding along a distributary at a time of demand and finding the calculated supply quite sufficient to give water to the last outlet, or to go down the Main Canal and find each distributary getting its allotted supply while the right balance is passing forward."

7. Proposals for a similar lease system, modified to suit conditions in Bombay, were placed before the Irrigation Commission by Mr. Visvesvaraya, then Executive Engineer, Bombay, and met the Commission's approval. The same views he put before the Irrigation Conference, Simla, in 1904 in his paper entitled "Economy of water in Deccan Irrigation," and this system has been introduced on the Nira Canal in Bombay.

8. The defect in any lease system on blocks lies in the fear that the zamindar may waste water if it is too much, but the remedy lies in our hands by adjusting the supply according to the needs of each outlet. This cannot be done during the currency of a lease, but certainly can be done about the expiry of a current lease and before its renewal.

9. Such a system implies the existence of co-operation amongst the cultivators themselves, chiefly for the purposes of internal distribution of water. *Panchayats* or Irrigation Boards can be appointed (on a basis of election) for such purposes. Such examples exist both in India, and in other countries. The Locra system in Spain, so admirably described and advocated by Mr. Schonemann on pages 43 to 49 in his printed report on "Tour of Inspection in Spain and France," is one good instance. In Madras the Collector of Nellore, Dewan Bahadur R. Ram Chandra Rao Avergal, has introduced such boards in certain villages of Nellore district in years 1911 to 1914, and they are reported to be working satisfactorily. The boards are elected, and their chief functions are—

(i) To manage efficiently the irrigation on the reservoirs after the water emerges out of the several sluices;

(ii) To see that no set suffers from want for water, that no single set is benefited to the prejudice of the other sets, and that each set gets its proper supply of water;

(iii) To get all their difficulties removed so far as irrigation is concerned by placing themselves in direct communication with the Public Works and Revenue Departments;

(iv) To see that the rules of the Public Works Department in the matter of keeping the sluices open are enforced;

(v) To suggest to the Public Works Department any temporary or permanent alteration in the rules;

(vi) To exercise a general supervision over the work of the *Panchayats* and to guard specially that the richer ryots are not benefited at the expense of poor ryots; and

(vii) To supply labour to the Public Works Department on requisition. In Ceylon also (according to an article by Inglis, in the "Indian Engineering" dated 12th May, 1917) there is an Ordinance which empowers the Executive Government to constitute by proclamation any suitable area as an Irrigation district. After such proclamation a meeting of the proprietors of that area takes place, and in this meeting they appoint a committee to be associated with a representative of the Government for framing rules for the encouragement and extension of paddy cultivation and enforcement of ancient customs relating thereto. The proprietors also determine if the Ordinance shall be carried into operation by the aid of headmen, or of village councils or both. The headmen, who are elected by the proprietors and who receive pay, work under the direction and control of the representative of Government. The village councils are made use of in dealing with persons accused of breach of rules or customs. The President of the council, who is either the Government representative or some one deputed by him has, however, full powers, so that the council are rather in the position of advisers. The proceedings are summary, advocates or agents are not permitted to appear, nor is any appeal allowed to a superior Court. There is, however, a right of petition to Governor in Council. The powers are small, being limited to a fine not exceeding 30 rupees.

10. As regards the introduction of any co-operative system in the Punjab, this question along with the allied one of assessment by volume, has in recent years been discussed in this Province—principally as a result of criticism on Mr. Schonemann's proposals in his Report of Inspection in Spain and France (mentioned above)—

(i) By Government, both departmentally and in a conference of officers *vide* the two publications:—

(*a*) Selections from the records of the Punjab Irrigation Secretariat—Introduction of Co-operative Management of Irrigation in the Punjab (published for official use only).

(*b*) Proceedings of a conference held at Simla on 12th and 13th September, 1917, on the more economical use of water for irrigation and on connected subjects.

(ii) By Press, *vide* the two articles in the Civil and Military Gazette, Lahore—

(*a*) "Spanish Irrigation methods" in the issues of 30th and 31st December, 1915.

(*b*) "Irrigation charges by volume" in the issue of 22nd June, 1916, by way of criticism on a paper on Kennedy Gauge outlet read before the Engineers' Association, Lahore, by Mr. Prabh Singh.

(iii) By a professional body like the Engineers' Association, Lahore, in a paper by Mr. Bur Singh on "Sale of canal water by bulk and its distribution by Panchayats" read at the annual meeting of 1916, the interesting discussion on which brought to light another instance

of charge by volume and co-operative management in the case of the Aragon Canal in Spain.

What form the co-operative system will take in this province and what fate it will meet, experience alone will show, but there is no doubt that a beginning should be made in suitable localities. There is no reason why it should not succeed if introduced with caution and developed with care, when it has been successful on the one hand in such civilised countries as Spain, and on the other amongst such wild people as the tribes of Afghanistan and Seistan. A short quotation from the *Civil and Military Gazette* article (*a*) mentioned above will not be out of place here. It says that ". . . . local self-government will evolve itself under compulsion in the least favourable soils, and when the pressure is strong enough it will develop authority more effective than despotism. Precisely the same effects may be seen on the frontiers of North-Western India. Even the most lawless tribes in Afghanistan and Seistan manage to hammer out some kind of a workable system of making and maintaining large watercourses or *karez* some of which almost deserve to be called canals. Within the British border the old system of local self-management seems to have largely disappeared, to judge from the absence of any mention of it in the Gazetteers of the North-West Frontier Province, though for Bannu Mr. S. S. Thornburn has left on record a remarkable description of such a system. But in one respect it differs essentially from the democratic principles in force in Spain, for the distribution of water is not effected by any selected body or official, but a family of Shaikhs which, many generations ago, obtained water, and probably land as well, on condition that they preserved an equality of partition between two branches of a canal. Nevertheless, 'the great feature,' on the Bannu Canals, and one indicating a remarkable power of self-Government is the method by which each turn or what may be called the periodicity of applying water is regulated. This method is simply the casting of lots (*isk*)." These extreme examples are given to show, that when some form of co-operation exists in both civilised and uncivilised localities—the details suiting each locality—there is every propect of its success, if introduced in other parts of India.

11. The suitable localities in the Punjab to start the experiment, are either the Chenab and Jhelum Colonies or the purely rice tract like the Raya Branch; the former because each village is practically a block watered by one or two watercourses, and has a homogeneous population, and the latter because there is only one crop (rice) grown at a time when the demand for water is fairly uniformly keen.

12. I will now offer such suggestions about the introduction of this system, as occur to me after perusal of all the literature that has fallen in my hands, keeping in view such points as were salient features of the discussion in the Punjab.

I. Preliminary—

(i) The system should be started tentatively and with caution. It should be first on a well-established distributary.

(ii) It should be started on a voluntary basis. A year's notice should be given to cultivators to the effect that with effect from next succeeding *kharif* on that particular distributary the system would be in force and applications should be invited to come in by the 1st March preceding that *kharif*.

(iii) As soon as a dozen applications (one for each outlet) have been received, a special officer whose sympathies are with the scheme, should be appointed to introduce, work and develop the system.

(iv) To begin with, the outlets as they are, should be dealt with, as the zamindars will have known their working for several years. Later on changes can be introduced.

conveniently kept as easily manageable multiples of 3 inches. Thus if 3 inches normal working be taken as 1—then—

3½ inches (*kor* in cold weather or normal in hot weather) = 1½.
4½ inches (*rauni* in cold weather and *kor* in hot weather) = 1½.
6 inches (*rauni* in hot weather and rice watering = 2.

In Table II these indices will be applied to facilitate calculation.

3. The proportion of *kharif* to *rabi* on different canals varies from 1:1 to 1:2. The Upper Bari Doab borders on the ratio of 1:1, there being slightly more *rabi* than kharif. Assuming 1:1 will not make material difference in calculation but will simplify it a good deal.

4. Let us then, take the main features of the principal crops in a narrative form.

Taking *kharif* crops first—

(i) *Sugarcane.*—This crop is sown from about 1st March to 30th April. The preliminary watering is given 10 or 12 days before sowing. *Rauni* is done about 10 per cent. in February about 10 per cent. in April, and the bulk of about 80 per cent. in March. It requires one watering a month after sowing and thereafter one watering every fortnight in summer and one watering every month in winter, but none later than 31st December. The area that may require water after 15th November is about 50 per cent. of the total. The crushing starts about 1st of November, and lasts till 31st March. A certain proportion is used as fodder.

(ii) *Rice.*—Transplanted rice only is taken into consideration. The land receives an ordinary preliminary watering, and then a copious watering is given about three or four days before transplantation. Puddling is done for about two days and transplantation immediately follows. Transplantation lasts from about 1st July to about 20th August. From the date of transplanting to about 15th October a copious watering is required every eight or ten days. Harvesting goes on from 15th October to 30th November.

(iii) *Cotton.*—It is sown from about 20th March to 15th June, the major part being done from 1st April to 15th May. The sowing is done about four or five days after preliminary watering. One watering is required about one and a half months after sowing and then one watering every month to end of October. The picking lasts from about 1st of September to end of December.

The remaining *kharif* crops may be divided into two classes with regard to water requirements. The first class is the early fodder crops of *chari*, *moth*, and maize near towns. The second class consists of late *chari* or *jowar* maize, *gowara*, *mong*, *bajra*, and late *moth*, whose water requirements are much the same. The remaining crops such as vegetables and melons in gardens, hemp and sesamum occupy such an insignificant area, that they can be neglected for purposes of our discussion. Of *chari* and *jowar* about one-quarter to one-third is early fodder crops of class 1, and the rest later fodder and corn crops of class 2.

(iv) Taking the first class, namely, early fodder crops. These are sown from about 20th March to 15th May, the first watering being given five to ten days before sowing. After that they require three waterings, one every twenty days about, till they are cut from 15th May to 15th July.

(v) The other class is sown from about 1st July to 15th August, sowing being done four or five days after preliminary watering. After sowing it takes one watering every 25 or 30 days till early in October. It is harvested from 15th October to end of November.

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Taking *Rabi* crops next—

(vi) *Wheat.*— The preliminary watering is done from about 1st October to 1st December, and sowing say 15th October to 15th December. The waterings after sowing commence from December and go on say till end of March, there being on the average one watering every month. The harvesting lasts from about 15th April to 10th May.

(vii) *Barley.*—This is always a small percentage of *rabi* crop and its sowing season is November. It takes about one watering less than wheat, and is reaped from about 1st April to 15th April.

(viii) *Gram.*—That on canals wants one preliminary watering about ten days before sowing, which last from 1st September to 15th October. the major portion being sown in September. It may want one water about February or March, and is cut from 1st April to 30th April.

(ix) *Toria.*—It is sown from 1st September to 15th October, five to ten days after preliminary watering. It wants about two waterings up to December and is then cut from 15th December to 31st January.

(x) *Senji.*—This is a very important fodder crop. It is sown in cotton a good deal. It does not ordinarily want ploughing. It is sown from middle of September to middle of November and seed is thrown a day or two after first watering. It requires water say once in 20 days till about end of March. Feeding the cattle on it lasts from about 1st February to 30th April.

Any miscellaneous *rabi* crops may be taken half of the nature of wheat, such as *sarshaf* and oats, and half of the nature of gram, such as *masur*, and their percentage is insignificant.

5. As said above, this narrative is tabulated in a concise manner in tables I and II. There is a certain degree of indefiniteness about dates and the proportion sown in each month of the sowing period, but we may reasonably fix these things quantitatively in our mind, and from this determine the state of crop-requirements of water in each month. In table II, column 2 gives the names of the principal crops with regard to water-requirements, and column 3 gives its percentage in the *fasl* to the nearest five. In the column for months, the figure on the left of the × mark gives the percentage requiring water in a month, and the figure on the right side of × mark gives the number of waterings required; the product of these two is termed " water-requirement index." This is totalled for each month and the last row gives the relative crop-requirements of water month by month. The index on watering shows the nature of watering as given at end of paragraph 2. The figures are tentative only to illustrate the idea, but the results in the last row may be taken as giving a fair first approximation of the relative water-requirements by months. Column 16 in table II, shows relatively in what proportion principal crops consume water on the Upper Bari Doab Canal (perennial section), and it will be seen that wheat takes the most. If we divide column 16 by column 3 the result in column 17 will indicate the number of normal waterings of 3 inches required by each crop on the average. In the case of rice, the figure 17 really means eight or nine copious waterings, each double the normal Since the normal depth of each watering is taken as 3 inches, then column 17 divided by four gives the delta of various crops in the field. This is shown in column 18.

6. It will be seen that making all allowances, the water requirement is at its highest in September and October, and it falls in November and continues so in December, rises and keeps steady through January, February and March, and is at its lowest in April and May. It regains position in June, and then goes on rising, keeping steady in July and August, and reaches its climax through September and October. If we could keep up our supply in this order, this would give the best adjustment; but

II.—Working—

(v) The unit should be an outlet. The fact, that there are often more than one village on an outlet will not affect the question materially. On the voluntary basis, they shall have agreed amongst themselves before they apply.

(vi) The irrigating community on the outlet, through their elected syndicate, should undertake to pay in some prescribed manner a certain fixed amount for the outlet at the end of each *fasl*.

(vii) The amount for an outlet should be based on the average of the earnings of the previous three years, to the next higher half-hundred, to make the amount a round lump sum.

(viii) The lease should, to begin with, be for three years; and if the scheme succeeds it may be extended to seven years as in Bihar, and if necessary lease-money may be enhanced on some suitable basis.

(ix) The payment may, with advantage, be made through co-operative banks, which if not existing in the locality may be started. The bank should undertake to pay to the Department on fixed dates and realise the same from the syndicate in such manner as may by legislation be decided. The dates may be 1st January for *kharif* and 1st July for *rabi*.

(x) To begin with at least it will be necessary to grant a certain remission *per diem* for the days over and above a certain minimum number of days on which the supply in the distributary may fall below a certain minimum level. For this purpose, gauges may be fixed for suitable reaches, and if the gauge falls below a certain minimum in that reach on a day, that day should be counted. Gauge-readers will read the gauges as usual, and since these readings will be connected on the distributary system, there is not much fear of fraud. The syndicate must be made to agree to accept our gauge register record as correct. The above will be somewhat on the lines of supply of power to flour or other mills on canals.

(xi) The canal *patwari* should have nothing to do with an outlet under lease. For statistical purposes the records of the civil *patwari* would quite do.

III. The syndicate or *panchayat*—

(xii) The syndicate should be elected, the constituents being all the land-owners and *maurusi* (occupancy) tenants of the commanded area of the *chak*, a certain area say ten acres having one vote. The system of election may be determined by legislation.

(xiii) The syndicate should be in office for three years, and suitable rules may be made to fill up vacancies.

(xiv) The strength of the syndicate will vary with the area of the *chak*, there may be say one member for every 50 acres, with a minimum of three.

(xv) Each syndicate may determine, by rules framed under legislation, the best and most convenient local mode of collection of revenue; but I would suggest that it may be proportional to the time the water course was used by an irrigator. Such an account would be simple, and approximate check on it would be the *warabandi* mentioned in next clause. The amount realised should be the lease money, plus cost of working.

(xvi) Distribution of water should be according to a *warabandi* fixed in an open meeting of the syndicate attended by all irrigators. It may be occasionally revised.

(xvii) Accounts should be as simple as possible and may be kept by a *munshi*, who should have nothing to do with any work in the field,

the syndicate to decide the best mode of reporting time to the Munshi. Where there is better confidence, the individual irrigator's report might do; otherwise the syndicate may employ a patrol for the purpose. The above are mere suggestions.

(xviii) The selected officer—he may with advantage be the Executive Engineer of the Division—should help the syndicate with advice; but he should not have any executive power over them.

IV. Miscellaneous—

(xix) With regard to the repairs of the water-course, it will naturally be kept by the people in a proper state; but there should be no interference during the currency of the lease. At the time of the renewal of the lease, the renewal should be granted only if the water course is reported to be in good condition, as is done in Bihar. With regard to masonry works on water-courses the present system may continue.

(xx) All charges on account of waste of water will naturally be abolished as also *kharaba* remission. Charges for waste of water are a trifle, and the *kharaba* remission is not much really and it abolition will be no hardship.

(xxi) But to begin with at least, some provision should be made to grant partial or full remission in the event of a wide-spread calamity. The present rule under the Canal Act according to which the Executive Engineer and the Deputy-Commissioner can jointly grant remissions, may be suitably modified.

(xxii) Some sort of legislation will, it appears, be necessary to bring about the change and to ensure its working.

13. The above are bare outlines. The introduction and working will require great thought and patience.

APPENDIX III.

Relating to Question 8—Irrigation—(*b*).

Note on the possibility of better utilisation of the pre-monsoon hot-weather supplies in perennial rivers, during the months of April, May and June.

To any observer in the field it is noticeable that on perennial canals a good deal of water is wasted during April, May and June. The high supplies run in these months are really unnecessary from the point of view of crop-requirements. I think they are run because water is available, the period is rainless, and instead of sending water to the sea it is turned on to land, but economy is not exercised. Of course village tanks are filled in this period, but this takes only a small fraction of the supplies actually run.

2. Analysis of crop-requirements makes the matter more patent. Below is given an analysis on broad lines, of the Upper Bari Doab Canal. Principal crops and their main features and water requirements will first be given in the narrative form, and to fix our ideas this narrative will then be tabulated. The normal depth of watering in cold weather is taken at 3 inches (it is never higher) the *rauni* in *rabi* will be taken 50 per cent. more or 4½ inches, and *kor* watering at 25 per cent. more or 3¾ inches. In hot weather the corresponding figures will be 3¾ inches, 6 inches, and 4½ inches. For this purpose hot weather will consist of the months of May, June, July and August. As to rice, both *rauni* and subsequent waterings will be 6 inches each. The above figures are fairly correct. They are only

in winter we are limited by the supply in the river, and since the principal crop in this tract is wheat, whatever of wheat can be done by winter supply is done and such *senji* as is required to keep up the live stock. There are some *toria*, gram and other miscellanies in *rabi*. The *kharif* supply will be determined by the land left available after *rabi* requirements.

7. It will be interesting to represent the results by curves.* For illustration the channel selected is the Kasur Branch Lower, a branch of about 800 cusecs full supply discharge having only three small *kharif* channels on it, so that it may be taken practically perennial. The black line on the diagram is the curve of "water-requirements index" as obtained in table II. The green, blue and yellow lines represent the average supplies in cusecs in the Branch by months, for the years 1916-17, 1917-18 and 1918-19, respectively. The first is one of about normal rainfall, the second year very wet, and the third year almost dry. The data for these curves are given in table III. The red line represents the curve of supplies if they had been proportional to requirement-index of the month. The method of drawing this last curve is described on the diagram itself. Since losses may be taken as approximately proportional to supplies and as the annual curves indicate supplies at head, and the red curve is drawn with reference to them, all the four supply curves include losses, and the comparison is, therefore, fair. Hence, where the red line is below the other coloured lines, the difference is an index of wastage; and *vice versa*, where the red line is above the other coloured lines, the difference indicates in *kharif* closures due to rainfall and in *rabi* shortage due to low river.

8. The wastage in May and June, and somewhat in April, is remarkable. The wastage in July and August does not matter, as the rivers are then high both in supplies and levels to meet all the requirements of the Province. There is no wastage apparent on the curves in September and thereafter, i.e., during the *rabi* season. There is really a wastage in *rabi* also; but in this note we are concerned with the apparent wastage in April to June, and I will leave out of consideration the wastage due to bad husbandry and want of economy in the case of flow-water as compared with lift-water.

9. It is worth investigating, therefore, how far by introducing rotational closures on perennial canals during the pre-monsoon period of the hot-weather (April, May and June, when the source of supply in the shape of melted snow is limited, and by when storage reservoirs if built shall have been generally exhausted), the supplies thus set free can be more usefully employed in other parts lower down the rivers. If successful the method will result in more cotton, which is such a desideratum in view of the Cotton Committee's Report. The sowing would be done with April to June supplies, the growing period would be helped by monsoon, and the maturing could be done partly by timely rains and later on by storage reservoirs or weirs.

10. The problem, however, is not so simple but is beset with difficulties both of administrative and agricultural nature. Thus:—

(i) Suppose a small percentage of full supply discharge was necessary to run in a month in distributaries, it would not be practical to run small supplies for long periods. The proper thing would be to run full supplies for short periods.

(ii) But in the latter event, the interval between two flowings may be too long in the hot-weather for crops to stand.

(iii) Also in case of short periods of flow, the time selected may not suit certain people, who are not ready for supply then; but perhaps this could be remedied by giving notice ahead.

* Not reproduced.

(iv) Again we have to consider whether what we think at present as wasteful—namely, system of deep waterings in hot weather—does not really result in better produce. Professor Warington says:—

"A plant may succeed in reaching perfect maturity with a scanty supply of water, and in this case there will be a relatively large produce for the quantity of water consumed, but a maximum crop will not be obtained in this way. A luxuriant growth demands permanent turgidity of the cells, and in an ordinary climate this condition can only be attained by a large supply, and a large evaporation of water. The largest crops can thus only be grown with a luxurious or wasteful consumption of water."

11. I would suggest that a committee of Irrigation and Agricultural experts and Civil Officers be appointed to investigate the question for the Province as a whole. The committee should see what supplies can be saved in the months named, and how they can be utilised to the best advantage. The figures in my note are no doubt approximate—my attempt being to derive qualitative results from approximate quantities—but they are accurate enough to suggest a detailed inquiry into the question.

TABLE I.

Statement showing main features of principal crops.

Serial No.	Name of Crop.	Date of first watering before sowing.	Date of sowing.	Waterings subsequent to sowing.	Date of harvesting.	Remarks.
1	2	3	4	5	6	7
	KHARIF.					
1	Sugarcane	20th February to 20th April.	1st March to 30th April.	One watering a month after sowing and thereafter one water every fortnight in summer and one water a month in winter, but none later than 31st December, about 16 waterings in all.	1st November to 31st March.	
2	Rice	15th June to 31st July.	1st July to 20th August.	One water every 8 or 10 days, about 8 copious waterings each double the ordinary	15th October to 30th November.	
3	Cotton	10th March to 10th June.	20th March to 15th June.	One watering about 1½ month after sowing and then one watering every month to about end of October.	1st September to 31st December.	
4	Miscellaneous crops early (Chari, Moth, &c.).	10th March to 10th May.	20th March to 15th May.	About 3 waterings once every 20 days.	15th May to 15th July.	
5	Miscellaneous crops late (Chari, Jawar, Moth, Mong, Mash, Maize, Bajra, Gowara, &c.).	25th June to 10th August.	1st July to 15th August.	A water every 25 or 30 days, up to early in October.	15th October to 30th November.	
	RABI.					
6	Wheat	1st October to 1st December.	15th October to 15th December.	One watering every month December to March.	15th April to 10th May.	
7	Gram	20th August to 5th October.	1st September to 15th October.	One watering in February or March.	1st April to 30th April.	
8	Toria	20th August to 5th October.	1st September to 15th October.	Two waterings up to December	15th December to 31st January.	
9	Senji	15th September to 15th November.	15th September to 15th November.	About one watering every 20 days.	1st February to 30th April.	
10	Barley	15th October to	1st to 30th Novem-	On the average, one watering	1st April to 15th	

TABLE II.

Statement showing the general water requirements by months on the Upper Bari Doab Canal (Perennial Section).

Serial No.	Name of Crop.	Percentage in *Fasl.*	WATER REQUIREMENT INDEX BY MONTHS.						
			January.	February.	March.	April.	May.	June.	July.
1	2	3	4	5	6	7	8	9	10
	KHARIF.								
1	Sugarcane	10	—	1½ 1×1=1½	1½ 8×1=12	1½ 1×1=1½ 4×1=6 } 7½	1½ 10×2=25	1¼ 10×2=25	1¼ 10×2=25
2	Rice...	10	—	—	—	—	—	2 4×1=8	2 6×1=12 2 8×2=32 } 44
3	Cotton	25	—	—	1½ 5×1=7½	1½ 15×1=22½	2 5×1=10 1¼ 4×1=5 } 15	1¼ 25×1=31¼	1¼ 13×1=16¼
4	Miscellaneous crops early.	10	—	—	1½ 4×1=6	1½ 6×1=9	1¾ 7×1=8¾	1¼ 6×1=7½	1¼ 5×1=6¼
5	Miscellaneous crops late.	45	—	—	—	—	—	2 10×1=20	2 30×1=60
	Total Kharif ...	100	—	—	—	—	—	—	—
	RABI.								
6	Wheat (including Berra).	60	60×1=60	60×1=60	50×1=50	† 5×1=5	—	—	—
7	Gram	10	—	5×1=5	5×1=5	—	—	—	—
8	Toria	5	—	—	—	—	—	—	—
9	Senji*	25	25×1½=37½	25×1½=37½	12×1½=18	—	—	—	—
	Total Rabi ...	100	—	—	—	—	—	—	—
	Total by months	—	97½	104	98½	44	48¾	91¼	151½
	Say	—	100	100	100	40	50	90	150

* Since no ploughing is done for *senji*, second watering is also taken as normal.

† As a precaution.

TABLE II—*concluded.*

Statement showing the general water requirements by months on the Upper Bari Doab Canal (Perennial Section).

Serial No.	Name of Crop.	Percentage in last.	WATER REQUIREMENT INDEX BY MONTHS—*concld.* August. Making allowance for timely rain.	September.	October.	November.	December.	Total by crops.	Number of normal waterings for the crops column 16 over column 3.	Field delta column 17 divided by column 4.	REMARKS.
1	2	3	11	12	13	14	15	16	17	18	19
	KHARIF.										
1	Sugarcane	10	$10\times2\frac{1}{2}=25$	$10\times2=20$	$10\times2=20$	$10\times1=10$	$5\times1=5$*	176	17·6	4·4	
2	Rice	10	$10\times3=60$	$10\times2=40$	$10\times1=20$	...	—	172	†17·2	4·3	
3	Cotton	25	$12\times1\frac{1}{4}=15$	$13\times1=13$	$25\times1=25$	$10\times1=10$*	—	155½	6·22	1·55	
4	Miscellaneous crops early.	10	—	—	—	—	—	37½	3·75	·94	
5	Miscellaneous crops late.	45	$5\times1=10$, $12\times1\frac{1}{4}=15$ } 15	$45\times1=45$	$25\times1=25$	—	—	175	3·88	·97	
	Total Khariff ...	100	—	—	—	—	—	716	7·16	1·79	
									Average		
	RABI.										
6	Wheat (including Berra).	60	—	—	$30\times1\frac{1}{2}=45$	$30\times1\frac{1}{2}=45$	$45\times1=45$	310	5·16++	1·29	
7	Gram	10	$2\times2=4$	$8\times1\frac{1}{2}=12$	—	—	—	26	2·6	·65	
8	Toria	5	$3\times2=4$	$3\times1\frac{1}{2}=4\frac{1}{2}$	$2\times1\frac{1}{2}=2$	$5\times1=5$	$3\times1=3$	18½	3·7	·92	
9	Seuji§	25	—	$10\times1\frac{1}{2}=15$	$13\times1=19\frac{1}{2}$	$2\times1\frac{1}{2}=3$, $15\times1=15$ } 18	$25\times1=25$	170½	6·94	1·74	
	Total Rabi ...	100	—	—	—	—	—	525	5·28	1·32	
									Average		
	Total by months ...		133	149½	156½	88	78	1,241	—	—	
	Say		130	150	160	90	80	1,240	—	—	

* As a precaution.

† That is 3 heavy waterings each double the ordinary.

‡ Five waterings seem [illegible]

§ Since no ploughing is done for seuji, 2nd watering is also taken

TABLE III.

KHARIF.

Statement showing average monthly supplies in Kasur Branch Lower, Upper Bari Doab Canal, in the years 1916-17, 1917-18 and 1918-19.

Serial No.	Name of month.	No. of days in the month.	SUPPLIES IN 1916-17 (NORMAL). No. of days of actual flow.	Total of daily discharges.	Average on days in column 4.	Monthly average column 5 over column 3.	REMARKS.	SUPPLIES IN 1917-18 (wet). No. of days of actual flow.	Total of daily discharges.	Average on days in column 9.	Monthly average, column 10 over column 3.	REMARKS.	SUPPLIES IN 1918-19 (dry). No. of days of actual flow.	Total of daily discharges.	Average on days in column 14.	Monthly average, column 15 over column 3.	REMARKS.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	April ...	30	24	14,641	610	488	The closure was due to rotation, as river supply was low on account of scanty rains in preceeding winter. No rains practically in March and April, but some in May.	8	4,657	582	155	Rotation; rainfall good on 11th and 12th April. Indent nil from 21st April.	15	7,737	516	258	About one inch rainfall in first week. Indented supply available, but indent nil to 15th April on account of rainfall in March and April.
2	May ...	31	25	18,005	720	581		25	17,242	689	556	About one inch rainfall. Indent nil from 27th May.	31	21,441	692	692	Dry, Indented supply available.
3	June ...	30	27	20,608	763	687	Local closure for 3 days; rainfall moderate.	21	14,182	575	473	Good rainfall. Indent nil to 6th June.	30	20,952	698	698	Moderate rainfall.
4	July ...	31	18	11,300	628	365	Very good rain, and closure in consequence.	30	21,145	705	682	Good rainfall...	31	29,037	743	743	Scanty rain.
5	August ...	31	25	13,772	563	445	Good rainfall ...	14	9,497	678	306	Heavy rainfall especially on 24th and 25th. Indent nil from 21st.	30	20,213	674	652	Scanty rain.
6	September	30	27	17,978	666	599	3 days closure on account of rainfall in first week, ordinary rainfall.	7	5,001	714	167	Very heavy rainfall. Full supply available, but indent nil all the time except 7 days of flow.	28	17,995	643	600	Scanty rain. Indent available only up to 24th.
	Total of days Kharif.	183	146	—	—	—	—	105	—	—	—	—	165	—	—	—	Average 139 days

TABLE III—*continued.*

RABI.

Statement showing average monthly supplies in Kasur Branch Lower, Upper Bari Doab Canal, in the years 1916-17, 1917-18 and 1918-19.

Serial No.	Name of month.	No. of days in the month.	SUPPLIES IN 1916-17 (NORMAL). No. of days of actual flow.	Total of daily discharges.	Average on days in column 4.	Monthly average, column 5 over column 3.	REMARKS.	SUPPLIES IN 1917-18 (wet). No. of days of actual flow.	Total of daily discharges.	Average on days in column 9.	Monthly average, column 10 over column 3.	REMARKS.	SUPPLIES IN 1918-19 (dry). No. of days of actual flow.	Total of daily discharges.	Average on days in column 14.	Monthly average, column 15 over column 3.	REMARKS.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
7	October ...	31	19	14,555	766	470	Rainfall practically nil; rotation.	10	5,081	503	162	Very heavy rainfall at end of October. Indent nil except for days of flow.	9	6,949	772	224	Scanty rain; rotation.
8	November	30	17	11,323	666	399	Rainfall nil; rotation.	26	7,827	301	261	Indent nil up to 4th November, demand slack during the rest of November.	11	7,635	694	254	Ditto.
9	December	31	11	6,085	553	196	Ditto	21	7,407	353	239	Slight rainfall; rotation.	8	5,916	740	191	Ditto.
10	January ...	31	8	5,593	699	180	Ditto	18	9,393	612	297	Dry; rotation...	9	6,093	677	197	Good rain; rotation.
11	February	28	8	5,573	697	199	Ditto	8	5,606	701	200	Dry; rotation...	10	5,575	508	199	Slight rain; rotation.
12	March ...	31	7	5,262	743	168	Half an inch rainfall. rotation.	12	5,252	658	170	Good rainfall. especially on 23rd from when to 10th April indent nil.	23	14,679	638	467	Fair rainfall in 4th week. Rotation to about 9th March.
Total of days Rabi.		182	70	—	—	—	—	95	—	—	—	—	70	—	—	—	Average 78 days.

Rai Bahadur Lala Wazir Chand Chopra.

Mr. N. WHITE, Chief Engineer of the Southern Canals and Secretary of the Irrigation Branch, Punjab.

Mr. J. B. G. SMITH, Chief Engineer, Irrigation.

Mr. B. H. WILSDON, Scientific Research Officer attached to the Irrigation Research Laboratory, Punjab.

Rai Bahadur Lala Wazir Chand CHOPRA, Superintending Engineer, Punjab.

Oral Evidence.

43,266. *The Chairman*: Mr. White, you are Chief Engineer of the Southern Canals and Secretary of the Irrigation Branch of the Punjab?—(*Mr. White*): Yes.

43,267. Mr. Smith, you are Secretary of the Northern Canals?—(*Mr. Smith*): Yes.

43,268. Mr .Wilsdon, you are Scientific Research Officer and scientific member of the Waterlogging Inquiry?—(*Mr. Wilsdon*): Yes.

43,269. Rai Bahadur Chopra, you are a Superintending Engineer?—(*Mr. Chopra*): Yes.

43,270. You gentlemen have presented us with a rather formidable array of documents. Would it meet your convenience if we examined each one of you in turn, or shall we examine you collectively?—(*Mr. White*): I think collectively, and then each of us can reply to points which affect him most nearly.

43,271. In the main I will address my remarks to you at this stage, Mr. White. Subject to the proviso that this Commission is concerned with agriculture throughout India, and cannot in the nature of things give that detailed attention to the technique of irrigation which a body charged *ad hoc* with the duty of inquiring into problems of irrigation and into irrigation schemes might be expected to give, I should like to ask you to tell the Commission what are the points to which in your view to which we should address our minds?—Waterlogging and the distribution of river supply (which includes the question of selling water by the volumetric system) are two of the most important points.

43,272. As you know, we are not concerned with the charges for water. The provincial memorandum, the notes you gentlemen have been good enough to provide us with and the note and the subsequent examination of Mr. Sangster (who was examined at Simla) provide us, I think, with a fairly complete picture of the position, but, touching on the matters you have mentioned, and dealing first with waterlogging, is it your view that this problem is one of growing urgency in the Punjab?—Yes.

43,273. Is it likely to assume a very important and serious aspect?—Unless it is kept under control, and even reduced from its present proportions, it will be very serious.

43,274. You think it is *the* problem of the future for you?—Yes.

43,275. Have you a research station where such questions are dealt with?—Yes.

43,276. Are you satisfied with the equipment and personnel of that station?—I think so. It has only been open a year. (*Mr. Wilsdon*): We have an experimental farm where we are experimenting on methods of drainage, and we intend to carry out experiments in pumping for the reclamation of waterlogged land.

43,277. You, Mr. Wilsdon, are in charge of the station?—Yes.

43,278. Are you satisfied with the staff you have?—We are feeling our way at present. The work will have to be extended, but at the moment I think we are doing as much as we can.

43,279. What line of research are you engaged on at the moment?—Waterlogging is the most important problem we are studying. We have taken up about 3,000 acres of waterlogged land. A drainage outfall is maintained by the Irrigation Department, and that is obviously the cheapest method of reclaiming waterlogged land if it can be made to work satisfactorily; but there are very great difficulties, both from a financial and an engineering point of view. That is the first stage of the experiment. We are also about to start experiments by pumping. The conditions of pumping for reclamation of waterlogged land are very different from those where tube or other wells are employed for obtaining a pure water supply; we have to discover the best means of pumping to keep down the water-table. Another point we have to investigate is the agriculture of such land; we have to keep a balance between the amount of water required to mature a crop and keep the soil sweet, and combat the great trouble of waterlogged land, the increase of salinity, with economy in the use of water. These points can be decided only by continued experiments in the actual growing of crops, and that we intend to do.

43,280. I suppose the trouble is due partly to the effect of irrigating the land (that is to say, deliberately releasing water on the land) and partly to leakage from the canals?—Yes.

43,281. Are you making any experiments in connection with the lining of canals?—Not personally, but I am a member of the Waterlogging Committee, and that body is now considering methods and the feasibility, as a whole, of lining canals, and endeavouring to obtain an idea of the probable efficacy of linings. We have carried out statistical work to determine to what extent the rise of the water-table is due to leakage from the canals and channels, and to what extent it is due to leakage from the fields and water-channels of the cultivators. That work has arrived at what I consider a definite conclusion. We have, of course, investigated only a small quantity of the material at our disposal, but it tends to show that of the water put on the land after it leaves the main canal one-third goes down to the water-table, so that any attempt to attack this problem by lining will afford only a partial solution. Lining may have an effect on areas where you see the water standing at present, and where the presence of a large channel accentuates the condition, but it cannot stop the general rise of the water-table.

43,282. What is the smallest canal you would suggest lining?—It is very difficult to say. I do not think you could line distributaries below 100 cusecs.

43,283. Do you agree with that, Mr. White?—(*Mr. White*): It is quite practicable to line them right the way down to the watercourse, but the expense would be enormous. (*Mr. Wilsdon*): That is what I had in mind. (*Mr. Smith*): Quite apart from expense, the lining of a main canal is going to be a difficult problem to tackle. There is one area where waterlogging threatens to be most severe. There is a feeder canal called the Upper Chenab which takes water from the Chenab to the Lower Bari Doab. It runs constantly, and is a big 200 feet canal with a depth of 10 to 11 feet. How are you going to line such a channel as that? There is another thing to be borne in mind. If we start lining or pumping on a big scale, you have to remember we want to keep the water-surface a certain distance (neither nearer nor farther) from the natural surface. The problem is really exceedingly intricate, and in my opinion it may be advisable to line the distributaries and content ourselves with pumping at a certain distance from the main canal so as to prevent the absorption of the leakage that is now taking place from the main canal into the subsoil. Some balance will have to be worked out to prevent our going too far one way or the other.

43,284. I take it that in the main your problem is prophylactic? The problem of attempting to deal with land already waterlogged or land where

the saline condition is already giving you trouble is comparatively speaking of minor importance; what you are concerned to do is to see that there is not an important extension of the trouble in areas not at present waterlogged. I judge from the notes provided by you gentlemen that pumping water from the subsoil by tube-wells is likely to be one of the weapons you will use?—(*Mr. White*): Yes.

43,285. Have you considered the possibility of subsidising the boring of tube-wells by cultivators in canal-irrigated areas? That might enable you to get the drainage done more cheaply? You could hardly expect the cultivator to use water from tube-wells on canal-irrigated land, because it would be very costly for him to do so; have you considered the advisability of making it worth his while to use subsoil water?—I think it would be almost impossible to get him to give up canal water, it is much cheaper and better for the land.

43,286. You would have to bribe him to do it, but from your point of view it might be the cheapest way of getting the drainage done. What would be the alternative? Would you yourselves sink batteries of tube-wells, pump the water from the subsoil and put it back into your canals and sell it again?—That seems to be the most feasible way, to have batteries of tube-wells along the main canals.

43,287. *Mr. Calvert*: Worked by your falls?—As far as possible, and hydro-electrically. It would probably be cheaper than taking the water on to the fields. We already have our own system of distribution.

43,288. *The Chairman*: It is almost impossible to devise means of persuading the individual cultivator on land irrigated by canals to sink and use a tube-well; is that the position?—Yes.

43,289. Are there cases in this Province of land which is irrigated by canal-carried water but where there is a shortage of water at certain seasons and where cultivators do in fact supplement the canal-carried water by tube-wells?—Not by tube-wells, but by ordinary zamindari wells, which are quite a different proposition.

43,290. *Sir Henry Lawrence*: Of the total area irrigated by canals in this Province, what proportion is irrigated by flow and what by lift?—(*Mr. Smith*): From 2 per cent. to 3 per cent. only is irrigated by lift.

43,291. *The Chairman*: Do you foresee the need for important drainage schemes in areas threatened with waterlogging?—(*Mr. White*): In the areas which are already waterlogged or are approaching that condition we have drainage schemes, and in one place where conditions are specially bad pumping by tube-wells is about to be started.

43,292. Do you think the total expenditure likely to be required in the next fifty years to deal with this problem of waterlogging will be very great, and do you think adequate provision will be made to meet it?—It is not an expense which will come suddenly. We shall tackle the worst cases first. The expenditure will be enormous.

43,293. Do you agree in the main with the note in the provincial memorandum on the question of volumetric *versus* area charge for water, which, as I understand it, says in effect that however much there is to be said in principle for the volumetric basis there would be very great difficulty at present in adopting it?—Not only would there be very great difficulty, but it is doubtful whether the zamindars themselves for several generations will want the volumetric basis. It is almost impracticable at present except in the case of large owners.

43,294. You do not think that, by means of co-operative societies or village panchayats, groups of cultivators holding contiguous holdings might collectively deal with the department on a volumetric basis?—(*Mr. Chopra*): That sense has to be developed in the people, and if that method were persisted

in it would develop, because co-operation in this Province has been very successful in other walks of life, and I am sanguine that in the course of time it will be successful in regard to irrigation also.

43,295. You think it will come?—Yes. It has already come in one instance, namely, in the case of some canals in Bihar, where the water is leased out on leases of seven years, the amount being fixed once and for all for those seven years.

43,296. Which do you consider the most hopeful line of advance, the village *panchayat* or the co-operative society?—The village *panchayat* has not been as successful as was anticipated, but it is a growing movement. An irrigation *panchayat* would differ in some respects from an ordinary village *panchayat;* it would be a syndicate of irrigators who would select some of their members to manage the thing. I have tried to outline a system for the Punjab in my note.

43,297. Are you anxious, Mr. White, to see the volumetric principle introduced?—(*Mr. White*): We should all like it very much; it would make things very much simpler and easier for us, but we do not feel sure that the water would be properly distributed.

43,298. Have you ever heard it suggested that when an experiment is in train and a tentative arrangement has been made for a cultivator to take his water on the volumetric basis, the rate is raised against him after the experiment has started?—I have heard that said, yes.

43,299. I suppose you have heard many things said about the department? —(*Mr. Smith*): Yes, many times. In one particular instance a volumetric rate was offered to a particular group of men and they turned it down, when as a matter of fact a somewhat higher rate was being paid elsewhere on another canal and a rate fixed in accordance with exactly the same principle.

43,300. Was the man who took the higher rate growing the same crops? —That has nothing to do with us.

43,301. But you make a different charge when charging on an acreage basis according to the crop?—Yes.

43,302. On the assumption that different crops require different quantities of water?—Yes.

43,303. Do you think that your scale of charges agrees fairly accurately with the water requirements of the crops?—I think it is far lower than it should be.

43,304. Might that be one reason why the volumetric scale is unattractive? —If they took the water on a volumetric basis and used it as they say they want to, to the best advantage, they ought to make more profit out of it.

43,305. How about the technical appliances required for measuring water? Are you satisfied you have solved that problem?—(*Mr. White*): For regulating the water? Yes.

43,306. You have something which is accurate and cannot be tampered with?—There is nothing that cannot be tampered with, but as a matter of fact our latest types have not been tampered with very much, and the cultivators seem to like them.

43,307. *Sir Henry Lawrence*: Have you introduced this volumetric machinery on many canals?—(*Mr. Smith*): No. It only applies to a few large owners, half-a-dozen at the outside.

43,308. It is still experimental, is it?—No, but there is only a certain number of people who own large enough tracts to be able to control the water for that tract themselves absolutely within their own holdings.

43,309. *The Chairman*: How far are the data upon which you work in charging different rates for different crops on the acreage basis founded on exact experiments to determine the precise requirements of each crop?—It is very difficult to say how much water is really required.

43,310. Does the department know with a reasonable degree of accuracy how much water is required in an average year in the Punjab to grow each of the main crops irrigated?—(*Mr. White.*) Yes, fairly accurately.

43,311. Do you think there is room for further investigation in that direction?—Yes, though I do not know whether it would be of much practical use.

43,312. I suppose you are expected to give a lead in these matters, and to educate to some extent, are you not?—(*Mr. Smith.*) I think that is more the function of the Agricultural Department. (*Mr. Chopra.*) At present we leave it to the cultivator really. I personally think it is desirable to have a station. We should ourselves determine for a series of years what are the average crop requirements of water.

43,313. Quite.

You do not agree with that, Mr. White; you do not think it is worth while making any investigations from the point of view of your own department?—(*Mr. White.*) We have made investigations, but we have to leave it to the zamindar.

43,314. To what extent are you in touch with the Agricultural Department in a matter of this sort? Is your touch with the Agricultural Department close and active?—We have never had any trouble in that way; I have personally consulted the Agricultural Department on several points.

43,315. *Mr. Barron*: Would it not be the Revenue Department that you would be in touch with in this matter as distinct from the scientific Agricultural Department?—The Revenue Department and the Irrigation Departments are working together. They are in touch on practically every matter. (*Mr. Wilsdon.*) It seems to me there are really two questions here; one is, how much water does the zamindar want? Statistical information has been obtained on that matter already and that information exists in the Statistical Department. The second question is, what economy can be practised in the use of water? Land has actually been set aside for the purpose of that investigation at Lyallpur, where experiments on the water requirements of crops will be put in hand.

43,316. By the Agricultural Department?—In collaboration between the Irrigation Department and the Agricultural Department. The original scheme was that both an Irrigation Officer and an Agricultural Officer should be in charge of those experiments, but there the matter has rested so far. The land ear-marked for the purpose is still untouched at Lyallpur.

43,317. Nothing has been done?—Not so far.

43,318. As regards such information in this matter as is at the disposal of your department, is it the result of your own investigations or the result of the investigations by the Agricultural Department, or some other department?—(*Mr. White.*) The result of our own personal investigations.

43,319. Or would it be truer to say, observations of cultivators' activities, or have you carried out experiments to ascertain this?—I think, it was in 1910 that we carried out a series of experiments regarding the depth of water and the number of waterings required to mature *rabi* crops, particularly wheat; those experiments were carried out entirely departmentally.

43,320. *Sir Henry Lawrence*: On your own cultivation or on the cultivation of zamindars?—On zamindars' cultivation.

43,321. *Mr. Calvert*: Is it not a fact that if a crop does not ripen, you get no water rate from it?—If it does not mature?

43,322. Yes. The supply of water to crops is determined empirically by the fact that unless you give sufficient water to ripen a crop, you do not get water rate?—Yes. If it does not mature, the water rate is remitted.

43,323. So that you are interested in giving sufficient water to ripen the crop?—Yes.

43,324. *The Chairman*: You suggested that distribution was a direction to which the Commission might turn its attention; would you develop that a little? Are there any points of particular difficulty?—That was mentioned partly in connection with the volumetric system; the change over from the acreage to the volumetric is bound to come, but I think it will take several generations before it will be acceptable to the cultivators as a whole.

43,325. Do you feel that your department is doing its best to encourage the change?—(*Mr. Chopra.*) At any rate, the initiative came from the department and not from the large land owners. It was started in 1921 by Mr. Bates, then Chief Engineer, and a number of big land owners came forward to adopt it; but owners of small holdings who predominate in this province have not come forward because of the trouble of internal distribution.

43,326. I suppose, from your point of view, the important advantage attaching to the volumetric method of charge is that it would at once stimulate cultivators not to waste water?—(*Mr. White.*) Yes; then they should make the water go further.

43,327. You calculate that there is an excess of about 20 per cent. used by cultivators, do you not?—Yes. (*Mr. Smith.*) Yes. That is about the figure.

43,328. 20 per cent. more than that required to produce an optimum crop?—I will not say the optimum crop, but the standard crop accepted by the settlement findings.

43,329. That is to say the crop you can grow year by year?—No, I mean the standard out-turn of the crops. (*Mr. Chopra.*) For instance, in *rabi* when the rivers are low the cultivator would like to have more water than he gets at present, and yet from the reduced quantity of water available his crops are matured.

43,330. The system of leases that has been presented to the Commission in an Appendix to these notes was, I think, prepared by you, Mr. Chopra?—(*Mr. Chopra*): Yes.

43,331. That would be an alternative to the volumetric basis?—Yes. What was in my mind was that by our own experiments we should gain correct knowledge regarding the optimum water-requirement of crops over a series of years embracing all sorts of seasons; and our module being such that, irrespective of what the zamindar may do with his water course, the proper amount of water is delivered at the outlet-head, we should give that amount of water and lease it out. In course of time as the zamindar gets more educated he will fall in line with our experimental results. A station should, therefore, be opened for making necessary observations.

43,332. In the meantime, the system is not in vogue in the Punjab at all, is it?—(*Mr. Chopra*): Not at all. I observed this in Bihar, and therefore I wrote that note.

43,333. Have you other gentlemen any comment to make on that suggestion?—(*Mr. Smith*): We never heard of it until yesterday; I think we might have been given some inkling of this before, so that we could think it out. But if the panchayat can develop its co-operation to the extent anticipated by Mr. Chopra, then you could have either the lease or the volumetric system. We are having a practical test of the *pan-*

chayat; they have now taken over the internal distribution of water in certain villages; if they can work that successfully, then there is some hope of their being able to work on the volumetric basis also successfully, but that is only a recent development, the *panchayat* controlling their own system of distribution; but I understand it is working quite satisfactorily, and where it has been introduced we take no action, which we are empowered to do under the Canal Act. We leave it entirely to the *panchayat*.

43,334. *Professor Gangulee*: In how many areas has the *panchayat* system been tried?—I could not tell you. I should say in about 80 villages, but that is entirely in the last two or three years.

43,335. *Sir Ganga Ram*: Are those 80 villages distributed over the whole of the Punjab?—I think so. I think there is a list of 80 villages.

43,336. *The Chairman*: Have you any particular scheme for future development which you would like to bring before the Commission and upon which you would like to lay particular emphasis?—(*Mr. White*): Those have all been mentioned in the written papers.

43,337. There is nothing to which you wish to draw particular attention; there are no particular schemes which you would like to bring forward?—Do you mean with regard to expansion of irrigation?

Yes. It occurred to me that there might be in the several schemes mentioned in the notes one particular scheme which you would like to see developed in the near future and to which you might wish to draw the attention of the Commission?—The Haveli Project is the more urgent, though it is a small one.

43,338. What arrangements have you for attending to complaints? If the zamindar taking water has some complaint to make, to whom does he make that complaint?—He can complain to any of the canal officers orally or by post.

43,339. Have you ever heard of a gentleman called Colonel Cole?—Yes.

43,340. Colonel Cole is appearing as a witness before the Commission, and he has handed in a note which will be part of his published evidence, so I do not hesitate to refer to it. He says that he has a good deal of difficulty with your department, which he divides under these headings: (1) drainage, (2) no service, that is to say, no attention paid to complaints, no attempt to rectify damage and irregular distribution of water, and (3) irregular charges and alteration of charges without warning?—He does not give any particular instance, does he?

43,341. He may provide them when he appears before us. In detail, for instance, he says on the matter of no attention being paid to his complaint, that his letters remained unanswered and no action was taken regarding them. In the matter of failure to certify damage he says: "When breaches occur, as they have done continually on my estate, it was only by claiming heavy damages that I obtained any relief." In the matter of irregular distribution of water he says: "Last *rabi* I was given 17½ days' water on one distributary out of 89 days. Only the other day, according to programme, I should have received a half supply commencing on 5th December; water was released from the Balloki weir on 6th, and instead of receiving a half supply for four days I received only 13 hours' water." Do you think it is likely that there has been some mistake in an office to account for this gentleman's complaints not even being answered?—I should think it very unlikely that no notice was taken of them; that is practically what he says.

43,342. *Sir Henry Lawrence*: You mean that it is very unlikely that no reply was sent?—Yes.

43,343. *The Chairman*: What grade of officer would be dealing with a complaint of this sort?—I very often get complaints myself from zamindars.

43,344. Direct to you?—Direct, three or four a day sometimes.

43,345. Perhaps Colonel Cole has missed his opportunity in not writing to you direct; would you like us to suggest that to him?—(*Mr. Smith*): I have not had any complaint from Colonel Cole since I have been here; that is since December, which is not a very long period; but I think if I met Colonel Cole I should tell him if he had any complaints to bring them to me, and if he was not satisfied with the action I took, then he would have cause to complain; otherwise I do not think that he has any cause to complain.

43,346. *Sir Henry Lawrence*: Was there any breakdown on this particular system?—I do not know the details to which you are referring.

43,347. Which canal is this on?—The Lower Bari Doab. Thirteen hours' supply instead of four days does seem a serious matter; there must be some special explanation of a thing like that.

43,348. *Sir Ganga Ram*: It has been very common this year?—Not 13 hours out of four days. What are you to do when your river does not give you enough water? I know there are very tight conditions at present. When I left Montgomery a week ago we had hoped we were going to get a full supply of water from now to March; then came suddenly the cold snap in the hills; the Chenab river decreased from 9,000 cusecs to 6,000. We cannot produce the water from our pockets for Colonel Cole or anybody else; we have not got an unlimited supply on tap; we have got to do the best we can when nature treats us in this way.—(*Mr. Chopra*): In the linked canals which include the Lower Bari Doab a very careful programme is made out; all the Superintending Engineers meet and base their programme on the minimum supplies expected in the rivers. This year, as Mr. Smith has said, the river Chenab fell even below that minimum, so that the Lower Bai Doab, being at the tail of the series, probably may have suffered more.

43,349. *Sir Henry Lawrence*: Was any damage done to the headworks of this Lower Bari Doab Canal?—(*Mr. Smith*): No, no damage was done to the headworks, but we were having trouble. That is quite apart from the shrinking of the Chenab river. There was a delay; we had a closure of a canal, if that is what you are alluding to, for a month. Unfortunately, we could not finish the particular job for which we had the closure within a month; we had to extend it by five days.

43,350. Which month is this?—January.

43,351. This particular complaint refers to December?—I do not know what the cause of that was; there must be some explanation, but that again I only saw for the first time yesterday.

43,352. *The Chairman*: I should like to read to you another extract from Colonel Cole's note of evidence. He says: "The average zamindar is absolutely in the hands of the *patwari*, the lowest paid official on the revenue staff. It is the *patwari* who reports on the crops. It is the *patwari* who can report on excess water and also on shortage, and he is the man to whom ultimately come all complaints or petitions for report. To stop the very serious discontent which such matters cause, and it might be appreciated that hardly any of these complaints are voiced, for it is well known that the lengthy enquiry which will ensue will probably end in nothing more than to make an enemy of a very powerful official, I would make the following suggestions:—

That the fixing and collection of water rates should be divorced from the Irrigation Department. The Irrigation Department should be solely concerned with the engineering side of the problem of supply.

The duty of the water and charges to be made for it should be fixed, as in the case with the land revenue, for long periods. There should be no power to alter these items in the hands of departmental officers."†

What do you say to the suggestion that the fixing and collection of water rate should be divorced from the Irrigation Department?—To start with, we do not fix them; they are fixed by the Governor in Council. Collection is effected by the Revenue Department.

43,353. *Mr. Calvert*: You assess them?—We assess them.—(*Mr. White*): We carry out the registration, i.e., we measure and register the areas irrigated by crops.

The Chairman: I am quoting Colonel Cole's words, "The fixing and collection of water rates should be divorced from the Irrigation Department"?—The fixing and collection of the rate does not rest with the canal authorities.

43,354. What about the suggestion that the registration of water rates should be divorced from your department?—That is a subject which has been continually raised for about fifty years, and I think each time it has been brought up it has been decided that it is much better to let it remain with the Irrigation Department.

43,355. *Sir Henry Lawrence*: To what extent has the *patwari* any discretion in fixing, assessing, or collecting revenue?—None whatever. He merely registers.

43,356. Then can you explain what is the meaning of Colonel Cole's complaints? It is not at all clear from his words?—There are about ten points in that statement. We have nothing to do with the fixing of rates and collection of revenue.

43,357. Then where does the discretion come in?—The irrigated crops are entered up by the *patwari* under certain rules, but then the *patwari's* work is very thoroughly checked.

43,358. Is the point that the *patwari* may be corrupt or tyrannical?—He may try it and run the risk of being found out.

43,359. Do you mean in reporting the areas of matured crops? Is that the point?—In reporting the class of crop that is grown as well as the areas.

43,360. That may alter the rate to be collected?—He might do that, but he would almost certainly be found out.

43,361. That is the point on which this complaint centres?—Yes.

43,362. *The Chairman*: Is there any other point with regard to which the *patwari* is accused of corruption?—Well, he might neglect to enter up a field at all; he might leave it out entirely for a consideration. That, again, is at the risk of being found out; it is hardly worth his while to do that.

43,363. *Sir Ganga Ram*: And also in reporting *kharaba*?—No, he does not report *kharaba*.

43,364. Who does?—(*Mr. Chopra*): The zamindar makes the complaint.

43,365. I mean the crop area of *kharaba* which is to be given to the zamindar?—(*Mr. White*): He has no powers at all in regard to that.

43,366. *The Chairman*: Colonel Cole also says in his note: "If you look for economy in the use of water, have a volumetric system of supply. When I was taking the volumetric system, Irrigation Department officers of all grades said to me: 'Why do you take the volumetric system; you are losing money over it.' If the officers express such ideas, as they have done to me constantly, the popular idea would naturally be against the volumetric system."* You were not one of the officers who suggested to Colonel Cole

†See page 489. *Ibid.

that he was losing money by taking water on the volumetric basis?—I do not see much point in that remark, which is supposed to have been made by a canal officer; why should the canal officer say, "You are losing money?"

43,367. If you tell people in this world that they are losing money it tends to make them uneasy. I think Colonel Cole's point is that the officers of the department have not really been concerned to encourage the adoption of the volumetric basis of charge?—Well, under present conditions I am not sure that we should not be wrong in encouraging it. We are quite prepared to do so. If any of the zamindars came forward and said, "We would like to take water on the volumetric system and we think we can agree to distribute it properly," we should be only too pleased to give it on those lines.—(*Mr. Smith*): I said as much to Mr. Roberts a month ago. I said to him, "Why do you not take water on the volumetric basis? We will encourage that system for anybody who tries to work it." I do not know what discouragement we gave Colonel Cole; I do not know anything about the case. All I say is that we offer certain rates now which are being taken by another man close by, and which are less than what has actually been taken on a contract signed by another person on the Lower Chenab Canal; and yet Colonel Cole refused it.

43,368. Mr. White has just told the Commission that he is not certain whether the department would be wise in encouraging the volumetric system?—I do not know whether Mr. White meant that exactly. (*Mr. White.*) I meant the ordinary zamindar.

43,369. In your note, Mr. Wilsdon, I see you think research operations could be carried out in conjunction with the Universities?—(*Mr. Wilsdon.*) Not entirely. I think you are losing a good deal by not making use of your Universities. The Universities during the last few years have developed at an extraordinary rate and are now doing very good research work in most branches of science. Unless you connect up with that work I think you are losing valuable assistance.

43,370. Have you thought out the details of a scheme of co-operation with the Universities?—I have not gone into great detail but I have a fairly clear idea of the sort of thing I should like to see encouraged. I mentioned an organisation under the Central Government more or less akin to the Department of Scientific and Industrial Research in England. I am aware that in England that department does not co-ordinate research work in agriculture but I think that is a pity. However, from what I have been able to see and from what I know of people working that department, I think it has been having an extraordinarily valuable effect on applied research work all over the country.

43,371. *Sir Henry Lawrence*: Is that in England?—In England. I see no reason why a similar organisation should not carry out similar work in India.

43,372. *The Chairman*: You suggest that particular phases of research should be "farmed out," as you put it, to Universities willing to undertake it?—Undoubtedly. In Indian Universities as in English Universities, there are for instance mathematicians and physicists who are using their brains on subjects which are of no immediate practical importance. I do not say that it is a bad thing that they should do so but they might be interested in real problems and then their work would be a net gain to the country. At the same time, from the students who work with them we could get a recruitment of the best material for carrying on scientific work.

43,373. Do you think there is a great deal of work to be done in the field of hydrodynamics in connection with irrigation?—I am convinced there is a great deal to be done. At present we are working on empirical formulæ;

we treat the flow of water as though it were a perfect fluid in stream line flow, whereas it is a turbulent flow of a viscous fluid. We shall learn something about the transport of silt when we begin investigating the matter from the strictly hydrodynamic standpoint.

43,374. I gather from your note that you see many years of useful work ahead of your particular section of the department?—Yes, undoubtedly.

43,375. Are you applying for any extension of staff?—Not at present; I have no accommodation for them. We are just at the stage of building a laboratory; the plans are out and the building will start at once. There is scope for expansion of the building and when we have accommodation will be the time to think of expansion of staff. So far I have had no difficulty in securing the staff which I think immediately necessary, either from the Waterlogging Committee or from the Irrigation Department.

43,376. Are you going to spend the money available in the main on buildings or on brains?—I should much prefer to spend it on brains. There is some difficulty in recruiting which I have mentioned in my note. You cannot always get the best man if you only offer him a temporary post and that is all we can offer at present.

43,377. Have you got sub-stations in typical districts of the irrigated area?—The only field station I have at present is the one I have referred to, at Chakanwali, where we are investigating a waterlogged tract.

43,378. Mr. White, are you satisfied with the existing organisation of the Government Department in the matter of irrigation? Do you think there is need for an Irrigation Officer responsible to the Government of India?—(*Mr. White.*) I think he would be extraordinarily useful to the provinces.

43,379. Take for instance a case of a difference of opinion between this province and the authorities in Sind as to the use of water. I suppose it is the case that a matter of that sort can only be settled by a third and presumably disinterested party?—(*Mr. White.*) It probably would have been settled some time ago.

43,380. By the Government of India?—Yes; probably this controversy would not have arisen if we had an efficient department in the Central Government.

43,381. Do you think that there is any room for research work on the problems of irrigation? Would you like to see the Government of India undertaking any research work on irrigation problems?—(*Mr. Smith.*) No, I think the research work should be done by the local Province; but the Government of India might have a man as a guide who could indicate the lines on which research might be undertaken; I do not think it would be any use his having direct control, because after all research in this particular matter applies to local conditions and a local man, in my opinion, should not be fettered in his freedom.

43,382. Your department is not interested in hydro-electric schemes as such, Mr. White?—No.

43,383. Who is responsible for that in the Province? The Chief Engineer, I suppose?—Colonel Battye. We have a hydro-electric scheme at Amritsar which we started some years ago.

43,384. *Sir James MacKenna*: Mr. Wilsdon, the opinion which you have expressed on the organization of scientific research in India is, I take it, based on the past experience which you may have had? Would you tell the Commission what your past experience has been?—Yes, I first came out to this country and joined the Educational Service and was attached to a Government college for four years; then when the Agriculturist Chemist, Mr. Barnes, was transferred to Pusa I was asked to take his place at Lyallpur where I remained for four years. It was there that I became

interested in soil work. I was on deputation at Lyallpur for four years and then I was drafted to the Irrigation Department and attached to the Irrigation Research Laboratory.

43,385. Where are you now?—I am still on deputation.

43,386. So that your opinion about the organization of scientific research is based on experience gained in more than one branch of scientific work in India?—Yes.

43,387. I think in answer to the Chairman you said that the University should take a larger part in scientific research?—Yes.

43,388. I inferred from your evidence that you think if we took Intermediate Science Students in the Intermediate Colleges into the Agricultural College the difficulty about English, mathematics and the elements of science would be overcome. Do you think that the knowledge of English or mathematics acquired by the ordinary Intermediate Science student is sufficient?—I do not say the ordinary Intermediate Science men, but you can select your men.

43,389. I suppose you find the same difficulty in the University with some of the Intermediate Science Students?—Yes, but a large proportion of the people who have taken to the Intermediate Science in Intermediate Colleges are perfectly fit to go on to the Agricultural College with a little more instruction in English and also in fundamental science.

43,390. The result would be to raise the standard of the agricultural students?—Yes.

43,391. I think that you have been to Pusa several times. Have you any ideas about Pusa?—My idea is that Pusa is very unfortunately placed. Extremely valuable work has no doubt been done there, but I think there is this disadvantage that the work done at Pusa might have been done much more profitably elsewhere.

43,392. I think you are probably not correct in saying that there is not a single research student at Pusa. I know that there have been in the past?—I was talking with reference to my information when I enquired, there may be now.

43,393. Do you know what has happened to the proposal at a conference of chemists at Pusa to open a station either in the Punjab or in Bombay for work in connection with soil physics?—The result of that proposal was that a certain amount of land was earmarked in the Punjab and it still remains earmarked.

43,394. That has nothing to do with the work on which you are employed?—No. The idea of that work was to provide for the water requirements of crops.

43,395. And the work in which you are engaged is not connected with that scheme?—It undoubtedly will have to be with regard to waterlogged land.

43,396. At the same time your section might develop along the lines contemplated?—Yes.

43,397. *Professor Gangulee*: What have you to say with regard to the situation of Pusa?—It is a little out of the way, and is not in touch with other scientific work in connection with agriculture in other parts of India.

43,398. Are you of opinion that if it were situated in some other place the kind of co-ordination which you are thinking of would have been possible? The fact that Pusa is six miles from the railway station does not prevent the authorities from co-ordinating their research work, does it?—My point about co-ordination is this, that co-ordination should be carried out entirely by independent authorities who have the money at their disposal for distribution; under these conditions co-ordination may

mean something, otherwise all talk of co-ordination is more in the nature of a pious hope.

43,399. What remedy or remedies would you suggest in order that these disadvantages and disabilities may be removed?—I find it rather difficult to say. One method obviously is by very largely increasing the staff, but that I think would be the wrong method. I think myself that Pusa had better become more or less a Provincial research station as its work will be of more interest to Bihar than to the rest of India. If you want to encourage scientific agriculture in the whole of India, you must work through the several stations where you have the necessary diversity of climate and soil conditions.

43,400. So that you would not have a Central Research Station?—Except for work of a very fundamental character and scarcely agricultural at all.

43,401. That is precisely the work done in Pusa; it is chiefly fundamental in character?—I am afraid I can scarcely agree with you on that point. They are paying much attention to their particular soil which contains 40 per cent. of calcium carbonate and you will not find soil of a similar nature in the rest of India.

43,402. You say that at the present time at Pusa you have not got a large number of voluntary workers. Do you think that if an institution of that sort were affiliated to a University it would attract more voluntary workers?—I think so; it would not only attract research students, it would also have an effect on the science of the University itself by interesting other workers, and you doubtless need a great diversity of workers on such a very wide problem as agriculture.

43,403. You work under the Irrigation Department?—Yes, in one capacity, and in another under the Revenue Department.

43,404. So that you have two Departments to deal with; and your scientific work is under the control of the Irrigation Department. Where do you get your money from?—I have three budgets. My position is rather complicated at present. I receive one budget from the Irrigation Department for my scientific research work and in that capacity I am under the Chief Engineer. On the other hand I receive a grant from the Revenue Department as scientific member of the Water-logging Committee; that budget is spent on scientific work and more particularly on the statistical work which I have in progress.

43,405. Are you in touch with the Department of Agriculture in your research work?—Yes.

43,406. And with the work going on at Pusa or elsewhere?—I have not been to Pusa recently, but I have visited Lyallpur and discussed questions with the agricultural officers there.

43,407. One of your students is working at Pusa?—Yes, he was under me, and has since been taken over by Pusa.

43,408. You are also in touch with the work that is going on in Sind with regard to certain problems of soil physics?—More particularly with Poona, not with the work in Sind.

43,409. One witness has told us that he considers it quite wrong that you should work under the Irrigation Department. Do you agree with that view?—I cannot agree with that view; I find it extremely valuable to be in touch with the Irrigation Department. I have to deal with a lot of statistical work, and I have to keep in touch with, and enlist the sympathies of, the Irrigation Officers.

43,410. Turning to your irrigation research, do you think that, taking India as a whole, adequate researches have been carried out by the Department of Agriculture or by the Central Institute in the direction of finding

out practical scientific means for retaining soil moisture?—There is one big problem, namely, the water requirements of crops, and I do not think that sufficient attention has been paid to that.

43,411. Some 80 per cent. of the total area in India under crops is unirrigated, and therefore this line of research is of fundamental importance?—Yes.

43,412. Do you consider that such research should be carried out by the Central Research Institute or by the Provinces?—The conditions vary considerably in different Provinces and one has got to go all over the country to get results applicable to the various sub-soils and climatic conditions. The necessary diversity of experience can therefore only be obtained through a widely spread network of sub-stations, which must obviously be controlled by the Provincial Departments.

43,413. Do you not think that the Provincial Research stations could test the results obtained by the Central Research Institute, which may have special facilities for undertaking fundamental researches?—I prefer to say that we shall learn more by experiments under actual conditions than by trying-out results got theoretically at the Central Institute. I am very strongly of opinion that nothing should be done to discourage actual experiments with this object in view in the provinces.

43,414. You say that the experiments on alkaline lands have not been followed up satisfactorily. Do I understand that these experiments have been abandoned?—No, there is a farm still in existence. The urgency of the problem has somewhat decreased in this case, as it has now been discovered that if all this land were reclaimed, and there is a very large area of such land, there would not be sufficient water to cultivate it. That may be one explanation of the fact that this work has not been followed up energetically.

43,415. Is there any continuity of research, that is to say, whenever you have undertaken an experiment or a research problem, have you been able to follow it up?—*In this particular case* there has been an unfortunate lack of continuity and valuable results might have been obtained if the work had been pushed forward more energetically. For one thing, financial stringency stood in the way, and for another it is possible that the problem did not arouse the same interest with the people who were in charge, as was the case when I was in charge.

43,416. *Sir Henry Lawrence*: But we understood you to say that there was no water to cultivate it?—Yes, but this work was undertaken under considerable pressure from the Government. The Punjab Government had commitments to find holdings for pensioned soldiers so that at that time the matter was of urgent importance, and a large scheme was put forward by my predecessor for the reclamation of saline land, with the result that this research station was started. But the urgency of the problem is now somewhat less from the point of view of the Government, because as I have said, the land that we reclaimed would not have sufficient water.

43,417. *The Chairman*: We were discussing the desirability of the appointment of a Consulting Engineer to the Government of India. It has to be remembered that one proposal at this moment is that decisions on questions of irrigation affecting more than one province should be settled by an Irrigation Board, which might consist of the Chief Engineers of Irrigation in all the provinces sitting with the Consulting Engineer to the Government of India; they would be regarded as a Central Board. Do you approve of that proposal, or would you like to see one man responsible?—(*Mr. White*): I think that it might be under one man, but the Board seems the best solution under the present conditions to settle these particular points.

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43,418. *Sir Ganga Ram*: But that man must be a very senior man?—Yes.

43,419. *Mr. Calvert*: Mr. Wilsdon, I understand that the United Provinces are also considering a research division in the Irrigation Department to undertake problems somewhat similar to those which, I understand, you are undertaking. Have you any idea as to how you could work together?—(*Mr. Wilsdon*): Possibly by meeting frequently.

43,420. Could you divide the problems with advantage?—It depends on what equipment they are proposing to put down. The laboratory which we are building is for hydro dynamic research proper, with tanks and so on. Work of that sort can only be done on the model scale in a laboratory equipped in this way.

43,421. It is a question whether more work could not be achieved by the same number of officers if you were to come to some agreement as to the division of the problem?—That is quite possible.

43,422. On this Jullundur problem and the subsoil water raised from the well, does not a large part sink back into the subsoil?—Probably one-third goes back.

43,423. Not more than one-third?—No.

43,424. And the rest is lost by evaporation?—Yes, evaporation and transpiration by the plant.

43,425. On this question of scientific worker and practical farmer, do you contemplate that these two should receive education in the same college, or do you wish to have two different types of college?—I am not quite clear; but it seems rather that two types have to be catered for; one is the scientific man who does scientific work and the other is the more general man who will become a farm manager and be concerned with propaganda work. As regards the latter you want a less scientific man who would want more of economic and business training. I have not put forward any suggestions; but if you maintain an Agricultural College it seems to me by a suitable alteration of your course you might meet both ends if you take your man at the F.Sc. stage.

43,426. It is a question as to what extent the Agricultural Chemist should be trained in agriculture at all?—Yes.

43,427. Later on you suggest a Government physical laboratory. Do you mean something different from the Institute of Science at Bangalore?—I was thinking of the sphere of activity which would correspond with that discharged by the National Physical Laboratory in relation to the Department of Industrial and Scientific research. Bangalore itself might become a physical laboratory, but certainly there must be some laboratory at a very near date to which Government can refer its physical problems.

43,428. You say a Government physical laboratory must be an absolute necessity; that necessity could be met by the expansion of the Bangalore Institute?—I do not know of any administrative difficulties, but I think that might be done.

43,429. You say you lost two officers to the Government of India in a short time. Was that a matter of pay or other attraction?—Not so much pay as future prospects. If a man is offered a temporary post on Rs.500 a month he would prefer Rs.400 a month if he has a prospect of rising in the service after some time.

43,430. The only difficulty here is the attraction is not sufficient to retain him?—I cannot have a permanent post, that is the difficulty.

43,431. There is one question raised in the province which Colonel Cole also raises, about the divorce of the Irrigation Department from the assessment

of water rate. In one Province the Irrigation Department is entirely an Engineering Department and the assessment of charge for water is left entirely to the Revenue Department. The Irrigation Department does not know to whom water is supplied and the Revenue Department does not know who cultivates the land. They simply take from the owner a fixed, definite, charge. That is in Madras. Do you think that would be possible in this Province? Here the officer responsible for the irrigation side is also responsible for the financial side. Your department not only constructs the canal, but also the water rate on the land irrigated. In the Madras system the officer responsible for the construction has nothing whatever to do with the financial aspect of his work, which do you think is a better one?—(*Mr. Smith*): What sort of canals have they? Has the Irrigation Officer any great responsibility in the matter of the distribution of the supply?

43,432. He distributes the water to the owner?—Where does he distribute it? Is it a tank irrigation system?

43,433. There is also the canal?—Does he deliver a certain amount of water at the outlet for one particular owner or a large number of owners?

43,434. I do not know the details; he simply supplies the owner with water?—The difficulty here is that you send your water through an outlet, not for one plot of land, not for one owner's land, but for many owners' lands and you cannot guarantee that each owner will get a certain crop or a certain number of acres of a particular crop. If each outlet was for one particular owner then the matter would be simple. It is because you have a large number of small owners that the problem is so difficult.

43,435. In the Punjab there is no agreement, is there, between your department and the cultivator as to the amount of water you are going to give?—No.

43,436. He has no right to get water from you?—No, not any fixed quantity.

43,436A. Has any decision been arrived at on this Western Jumna experiment? Has Government passed orders?—(*Mr. White*): No final decision has been come to.

43,437. Can you tell me to what extent is the reduction of the rate to Rs.2 an acre for fodder a subsidy? To what extent are you supplying water below the cost price?—(*Mr. Smith*): To a very great extent, particularly in the winter.

43,438. Can you get the water on to the field at Rs.2 per acre?—I see what you mean; you mean, does Rs.2 pay for the cost of bringing the water to an acre of land?

43,439. Yes?—I think it is just about it. The recurring charge per acre irrigated varies from Rs.1.5 to Rs.4.5. Rs.4.5 is an extreme case, but Rs.1.5 is a fair average; that is working charges only.

43,440. That does not include your interest charges on the capital?—No.

43,441. So Rs.2 is below the cost price?—Very much below.

43,442. To that extent you are actually subsidising the growth of fodder in this Province?—Yes, also green manure for which we charge nothing.

43,443. *Mr. Kamat*: With reference to the last question, is it not a fact that on the total capital outlay on your productive works you are getting here a return of something like 10 per cent., and if you include the indirect receipts you are getting a return of over 19 per cent. from your irrigation; it is given on page 29 of the Government memorandum?—According to the figures I have here the direct return is only 6·7 per cent., and direct and indirect, 15·7 per cent.

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43,444. On page 29 of the Government memorandum it is stated: "Considering direct receipts only the net revenue earned by productive works during 1924-25 amounts to Rs.2,33,47,065 or a return of 10·04 per cent. on the total capital outlay of Rs.23,25,68,890"?—It may be for one year. But unfortunately the interest charges were omitted in that memorandum. We discovered the mistake later. The correct figure is the one I have.

43,445. What is quoted in this Government memorandum then is incorrect?—That figure is incorrect.

43,446. Very well, taking 15 per cent. as the correct figure, even then do you not think that it is a very liberal return, a handsome return, for the taxpayer's money, so that you should give the taxpayer some relief or some reduction, some facility in rates or other ways, for instance, for fodder or other crops?—But for that indirect return you would not have hospitals, you would not have roads, you would not have schools and so on.

43,447. That is going outside the Agricultural or Irrigation Department. I am referring to agricultural matters with which we are concerned. The Irrigation Department on your own showing is making a return of 15 per cent., as much as the moneylender in the village does. In reply to Mr. Calvert you said you are charging Rs.2 an acre for fodder. Is this not a case, I ask, where you ought to consider the advisability of giving further relief in the interest of agriculture?—No, because that indirect return is largely from Crown waste land which is a windfall which you cannot continue to get for ever and ever. If these canals which give you all that magnificent return which you think they are now giving were constructed at the present day, they would be non-productive.

43,448. I am taking the case as it is; I would not go into hypothetical cases. The railways are getting not even 6 per cent. on their outlay and the Irrigation Department is earning 15 per cent. Is it not a case for a liberal treatment of the cultivator, that is the whole point?—It is not because the indirect return is due to the sales of land particularly and the sales of land will not continue for ever.

43,449. To turn to another point: the Chairman referred to the proposal for a Central Board of Irrigation Engineers, to which you showed your approval. There is one point in connection with that which I wish to make clear. Is this Irrigation Board of all the Chief Engineers in the different Provinces meant for the consideration of projects or is it meant for the adjudication of disputes between two Provinces?—(*Mr. White*): For both.

43,450. If it is meant also for adjudication of inter-Provincial disputes, would it be worth while or would it be advisable to refer for adjudication disputes in which two Chief Engineers are concerned between themselves? For instance, if Mr. X is the Chief Engineer for a particular Province and Mr. Y the Chief Engineer for another Province, what on earth is the use of closeting them in a room even for hours together to get any reasonable decision out of them?—None.

43,451. If you say the result is nothing, what is the good of framing an agency on these lines?—The Chief Engineers of other provinces are also there.

43,452. Better than that, is it not worth while to refer such occasional disputes to an independent body, say, a committee appointed *ad hoc* for the occasion? Which would be a better system?—(*Mr. Smith*): It must be a technical committee. Where are you going to get your technical men from?

43,453. Either from the Indian States or from England or from any other country in the world?—They will have no knowledge of irrigation

conditions as they exist here. They do not know how water is measured unless you get men from America.

43,454. But do you not think that Chief Engineers of all the Provinces come there with certain associations in their minds, prepossessions or prejudices?—I would expect them to give a fair hearing. For instance, in that particular case of X and Y there are other Chief Engineers of other Provinces to sit in judgment.

43,455. Mr. Sangster in his evidence given at Simla does not refer to this idea of assigning to this Irrigation Board the task of settling the disputes. He simply says that all schemes submitted to the Government of India would be laid before this Board. Is this idea of referring disputes to it also a later idea?—No; it was moved last summer and the Government of India have decided that. It was suggested by the Government of India and agreed to in most of the Provinces.

43,456. Speaking about the volumetric system, in this Government memorandum we are told that in the case of that system perhaps the large landowner would be benefited, but the smaller zamindar would have to content himself with the "crumbs" of water which the bigger zamindar would allow him to have; that is the word used there?—That means the small cultivator would only get such water as the bigger cultivator allowed him to have.

43,457. I am asking your opinion as an Irrigation Officer whether this is not admittedly a defect of the volumetric system?—I think it is. As I said, if the panchayat can control water distribution thoroughly, then there is some hope for the volumetric system in an area which is composed largely of small landholders.

43,458. Turning, once again, to Colonel Cole's complaints: I wish to ask you whether one of his allegations is correct as a matter of fact. Colonel Cole says that in April, 1919, he undertook to try the volumetric system. Later on, he says, "The rate was gradually raised from 20 per cent. to 60 per cent. over the acreage rate to choke us off." On the other hand, Mr. Sangster, the Chief Engineer, when examined by the Commission in Simla, is reported to have said he was in favour of a volumetric system. If that was the case, why did he choke off people who at the request of Government were experimenting with the volumetric system, by putting on very excessive charges." Now, I ask you, is it a matter of fact that the rates were raised from 20 per cent. to 60 per cent.?—As I mentioned a little while ago, I saw Colonel Cole's evidence yesterday for the first time and I cannot say whether it is a fact or not; at present I have not the information before me.

43,459. *Mr. Roberts*: Taking the irrigation works which have already been completed and which are proposed during the next few years, I understand you contemplate irrigating an area of 15,000,000 acres, according to this statement?—Yes.

43,460. At a cost of Rs.50 an acre, the total capital would come to 75 crores of rupees. You admit this generally?—Yes.

43,461. Looking at the agricultural side of the picture, supposing we value the land at Rs.500 an acre, as you are aware the land in the canal area is worth anything from Rs.700 to 1,000, but taking Rs.500 as the average price the agricultural interest involved is 750 crores. Now, what I wish to ask you is whether, where such a large capital as this is involved, you consider that the question of research has been properly taken up or not? Do you not agree that a very much bigger effort is essential to tackle the big problems that come before us?—In respect of waterlogging, soil physics and so on?

43,462. That is a very minor aspect, in my opinion. There are many other aspects of the question. In Europe or America, in controlling even a portion of this capital, they would have a separate research section?—Any research for the further development of areas is well warranted.

43,463. It would receive your support?—Yes.

43,464. Now we have heard about this question of water logging; it is mentioned as being more or less the most important difficulty at present I believe the area affected is under 1 per cent.?—Yes; it is very small at present, but it is likely to grow unless something is done.

43,465. Do you consider it altogether as an evil, or can you consider this as a reserve of water for future use?—If, of course, we can arrive at that stage when we can keep the sub-soil water at a certain depth below the ground level, 15, 18 or 20 feet (or whatever it is; our Agricultural Chemists will tell us), then we look upon that water table as a gold mine.

43,466. That is for the benefit of the Province as a whole? It is a very serious thing for the locality affected?—If you can allow that water to accumulate and can save that country where it is high, you will still be able to use that sub-soil water elsewhere.

43,467. Taking the question of drainage, supposing you are able to lower the water table 3 or 4 feet by drainage, is that all that you contemplate or do you expect to do more?—(*Mr. Wilsdon*): I do not think you can go beyond 4 or 5 feet by drainage. We have no definite information on it. That is the depth up to which they go in America.

43,468. The point I want to be clear about is whether, even if you lower the water table 3 or 4 feet, agriculture will be possible?—I think you will have to modify your methods of agriculture, but I think you can carry on with the water table at that depth; you will be able to grow crops with profit.

43,469. In tracts where the area is subject to rainfall, if your object is to take the water table 3 or 4 feet from the surface, whenever you have a heavy rainfall you are liable to get flooding, are you not?—Yes, but it will not necessarily imply disaster if you have got a proper surface drainage.

43,470. You do not subscribe to the principle that we should get the water table down to 8 to 15 feet which is the figure given by the Medical Officer of Health?—I accept that as regards village sites, but not for agricultural land in general.

43,471. The point is, the question of water table is one which should receive some attention?—We could not give definite information on that, but certainly it is a question for investigation.

43,472. With regard to the distribution of water, there is one point that I should like to make with regard to Colonel Cole's complaint. The area which he controls in proportion to the area under the Superintending Engineer is ·6 per cent.; is that correct?—(*Mr. Smith*): Yes, I think it is about ·5 per cent.

43,473. That being the case I think it stands to reason that you cannot expect individuals to take much of the time of an officer who is dealing with a large number of cultivators. My point is that you cannot expect an officer of that kind to be able to devote a large amount of time to every individual?—Not unless the case comes under revision before him.

43,474. With regard to the volumetric supply, I think in answer to the Chairman you said that the present low charge for the water was not deterrent to the volumetric supply. I put it to you that the farmer does not pay very much attention to the cost of water. It is so low at present,

not more than 10 per cent. of his gross receipts, that he does not consider very much what more he has to pay if he grows an extra acre. I put it to you, that being the case, that the present low charge is an incentive for economy; do you agree to that?—(*Mr. White*): Yes.

43,475. Then with regard to the volumetric supply, would you be prepared to arrive at a charge basis on the average returns for the area in which the applicant is?—(*Mr. Smith*): No; it is ordinarily done by reference to adjacent areas; that is what we do.

43,476. After allowing for *kharaba*?—You can have it either way. We take the calculation both for *kharaba* and no *kharaba*.

43,477. One of the objections to taking the volumetric rates is that you cut yourself off from getting *kharaba;* that is, once you take water by volumetric rates you pay for it whether you mature your crop or not. The point I want to bring out is whether you are prepared to take that into account in fixing your volumetric rates?—Yes, actually we do.

43,478. One other point with regard to your present system of administering the department is that a great deal of attention is paid to the amount irrigated by the cultivator. If a man is taking more than a certain proportion, there is a tendency to cut down his water supply. Now it will be a tremendous step forward, in my opinion, if we could get a kind of prescriptive right in that the farmer could claim an outlet of a certain definite full capacity for the area which he has. Supposing a man has an area of 1,000 acres and we say 4 cusecs is to be allowed, then he has an outlet full capacity of 4 cusecs. He can claim it whether he irrigates 100 or 90 or 120 per cent.?—He can claim a capacity in the outlet but not in the water.

43,479. No, because you cannot give him water in the winter?—You give him an outlet of a fixed size?

43,480. He has a claim on a definite capacity of the outlet in proportion to the land which he holds?—(*Mr. Smith*): In that case would he be prepared to pay for what we estimate to be the full revenue earning capacity?

43,481. He will pay as at present on acreage; I am not talking of the volumetric system now. If he is economising in irrigation and doing more than 90 or 100 per cent., no officer of the Irrigation Department should have the right to interfere with the supply so long as his outlet is not above full capacity. The point I want to make is this, that instead of the outlets being subjected to alteration if the cultivator is doing very good irrigation on a large area, I want the right to a definite capacity outlet to be chartered to the farmer. Once he has got that, he has got something definite. The small officials cannot come round and say, "You are doing so much irrigation that you are getting too much, I am going to cut down your outlet"?—(*Mr. Smith*): As a matter of fact the small official does not do it.

43,482. No, but it is done largely on his recommendation?—No outlets are altered except by a written order of the Superintending Engineer; but I quite see your point.

43,483. It is very often suggested by the minor officials?—I think you will admit that the reason why we interfere in that way is because we sometimes have difficulty in getting water to the tails of a channel or a distributary. Sometimes, no matter what you do, you can raise your head supply as much as you like, but you cannot get water down to the tail of a channel twenty or thirty miles long. If we say, "You will have to bear it, we cannot get you water," then you can leave things alone. But if it is our duty to get water to these people and there is no other means of doing it than by restricting or reducing outlets, then it has to be faced; it is unpleasant, it is not ideal but it cannot be helped.

43,484. Then you will not admit that the farmer has any right at all; he is subject to constant interference. What I want to know from you is whether you can give any promise of that kind? It would be a very great advantage?—(*Mr. White*): But it is quite a mistaken idea, I think, to imagine that immediately we find an outlet is doing good irrigation we pounce upon it at once.

43,485. I do not say that is generally done, but it is done much more largely than perhaps you realise?—(*Mr. Smith*): I think what Mr. Roberts wants is ideal if you have acreage rates. But I doubt if it is practicable in those cases where you fail to get water to the tail of your channel. What is to happen then? Are we to leave them without water?

43,486. Personally I think the difficulty of getting water to the tail is an engineering difficulty and it is not such that you should make the man at the top pay for it. I do not see any real difficulty; I do not think you will admit that you cannot get water to the tail without cutting down outlets; surely you will not say that is beyond the powers of the Irrigation Department?—Given a limited supply at the head, you sometimes have to interfere with the old type of outlet in order to get water to the tail. For instance, if a channel on which these outlets are situated is entitled to 100 cusecs, you cannot put 150 cusecs down that channel in order to get water to the tail.

43,487. You can put in any outlet you like; I am not arguing for any particular kind of outlet; the only thing I ask for is that you should give some definite figure so that the farmer may know what he can claim?—(*Mr. Chopra*): After all, a reduction of an outlet takes place, if it overdraws.

43,488. In that case it is above capacity; I have no objection to altering the outlet when it is above capacity; what I want is to divorce alteration from the area irrigated; leave that alone and keep to the outlet?—The reduction takes place when the outlet is discharging above a certain figure. This takes place for several reasons; one being the change of regime of a channel; if the channel rises and the outlet begins to overdraw, we have to change it.

43,489. I have no objection to that; I am not questioning that at all. I am simply asking that you should limit your interference at the outlet and not look at the area irrigated; if one man is doing more than another with the same supply, you should not interfere with the outlet?—I agree with that. (*Mr. Smith*): I think we all agree with that.

43,490. *Sir Henry Lawrence*: Can it be done?—That is the trouble; will it be practicable? I agree that it is the ideal.

43,491. *Mr. Roberts*: If we could get some definite step of that kind, I am certain there would be a big advance from the agricultural point of view; if the farmer has a definite right, he will not be afraid that if he increases his irrigation, something will be done.

43,492. *Sir Henry Lawrence*: Have you any suggestion to make, Mr. Roberts, as to how it can be done?

43,493. *Mr. Roberts*: I think it can be done. The department claim to have outlets now which will give a proportionate discharge; I do not think there is any great difficulty?—(*Mr. White*): I think you could get very near it.

43,494. *Sir Henry Lawrence*: Do you require some alteration of the irrigation rules, or how can it be done?

43,495. *Mr. Roberts*: In practice it is done even now to a very large extent, except that a large proportion of the changes that take place are made on the assumption that the irrigated area is too large. The area is absolutely divorced from reality; the department guarantees 66 per cent.

of irrigation, whereas it is known to everybody that all irrigation farmers work by 100 per cent. This right to irrigation means nothing; it is a nominal figure, which should not really be used at all?—(*Mr. Smith*): I agree that what you say is an ideal condition.

43,496. But you are not prepared to say it could be carried out?—We would try to carry it out, but not generally. We would certainly take on three or four channels experimentally.

43,497. One difficulty is that when planning a canal the whole of the area to be irrigated is not taken into account, constant expansion is taking place and new areas are being brought under irrigation at the expense of existing irrigators?—(*Mr. Smith*): I think I can draw your attention to something here which will show it is not correct to say that it is at the expense of the existing irrigators.

43,498. It is not in some cases?—Will you kindly turn to statement III of Note by the Chief Engineer, dated February, 1927, and look at the first four items. When the Irrigation Commission came in 1903, they thought that nothing further could be done with those old canals; they gave us a clean bill for that. Look at the last two or three columns, and see what we have done.

43,499. I question whether you have done it or whether the farmer has done it?—I do not say we have done it alone. At any rate, we have certainly done it with the help of the farmer; he could not get any more water and he made the utmost use of that water, in spite of the fact that the Irrigation Commission thought we could do nothing further with it. That is the one great argument against adopting volumetric supply to-day for all the canals. The Lower Bari Doab is not as efficient as the Lower Chenab canal; they do not use the water with the same amount of care on the Lower Bari Doab as they do on the Lower Chenab. Probably the soil has also something to do with it; but you cannot get away from the figures I have quoted.

43,500. I do not see the point even with regard to the volumetric system. No one wants you to bind yourself for too long a period, because we know ourselves that irrigation is improving, and we can get a constantly slightly increasing area; so that I do not think you should mix those two points. Would it be possible for the department to give us later a considered reply on this point, because I personally think that it is one of the most important points?—Yes.

43,501. If we could ask for something definite and simple of that kind it would give us a basis on which to improve things?—We will certainly consider it.

43,502. There is this Department of Industrial and Scientific Research at home. You contemplate a similar organisation for India, and you suggest that grants for Pusa should be under that organisation?—(*Mr. Wilsdon*): Yes.

43,503. Do not you think it would be rather risky with an existing institution of this kind?—I do not think there will be any more danger in securing grants than exists at present; I contemplate that the Agricultural Adviser would become chairman of this board or department controlling the grants and the second Director at Pusa would remain as Director of Pusa as a research institute.

43,504. Then if this board is composed mainly of agricultural officers, it is rather a different conception from that which I understood you had; I thought you suggested a general board for all scientific work?—I think eventually it would be a good thing to unify all applied research work in the same board; but obviously you will need representation of your agricultural interests in some way or the other.

43,505. Is it your idea that the Central Government should expand in other directions than Pusa, not concentrate so much on Pusa, but extend on other lines of research?—That is my opinion; they must encourage research work in the Provinces and not put all their money into one basket at Pusa.

43,506. In any programme of that kind you would like to pay as much attention as possible to the Universities and to the existing organisations in Universities?—Always; Government should consider what can be got out of the Universities when contemplating another research institute.

43,507. I think you said, in answer to one of the Members, that such co-operation would also benefit the Universities in bringing them into touch with practical problems?—Yes.

43,508. Do you think that also would be an important thing, to bring the best educational thought of the country in touch with agriculture?—I think that is very important.

43,509. Would you like to see Lyallpur specialise in higher teaching rather than in elementary teaching?—Yes, I think they are wasting their time in teaching elementary science. They should spend their time in teaching applied science; that is, in a three years' course.

43,510. You have had four years' experience in the department, and you have seen our agricultural assistants; you do not think there is any danger from having the first part of the course in other colleges?—I do not think there is any danger at all.

43,511. *Sir Henry Lawrence*: Mr. White, I think during the inundation season something like a million cusecs of water comes out of the Punjab rivers down the Indus past Sukkur. Is that figure about correct?—(*Mr. White*): Yes, that is about correct.

43,512. And in the winter that falls to about 30,000?—Yes.

43,513. As a result of the new projects in view, is there any likelihood that the winter supply will increase above that 30,000 cusecs?—(*Mr. White*): There is a possibility.

43,514. There are some projects I believe for storage in the hills. Can you say what amount of water will be so stored? Have you got any figures to show how much you can store up there?—(*Mr. Smith*): About two million foot acres in the Beas and about three million in the Sutlej, altogether about five millions.

43,515. What does that work out to in cubic feet?—A foot acre means a foot of water spread over an acre of land.

43,516. According to the projects you will utilize the whole of that in your winter irrigation; is that the intention?—More so in the winter and partly in the early *kharif*.

43,517. Very little will ultimately pass down through the rivers?—A certain amount will have to be released to keep reservoirs clean.

43,518. Have you got any idea of what that would amount to?—We will work it out and let you have the information.

43,519. Do you propose to extend inundation irrigation? I see a figure here of 400,000 acres of additional inundation?—That is the additional non-perennial area but controlled by a weir.

43,520. That is the only addition that you are making to your non-perennial area, is it?—The total additional area on that project will be 400,000 acres, and the bulk of that is non-perennial and a part only is perennial. But that is the total additional area which will be given water under the Haveli Project.

43,521. Is there any other project in which you are increasing the non-perennial area?—There is a lot of non-perennial area being increased in the Sutlej Valley.

43,522. From page 17 of the statement which I have before me, I see that the total irrigation proposed will amount to over 19 million acres. Can you say what proportion of that is perennial and what non-perennial?—I shall work it out and let you have the figures.

43,523. I do not quite understand this figure of 19 million as against the figure of 14 millions quoted by Mr. Roberts. Where does the margin of five million acres lie?—Mr. Roberts evidently omitted the contemplated projects; whereas this 14 million is the total of the completed projects there are others still under contemplation.

43,524. Does that other five million include the Thal Project?—The 14 million includes the Thal Project.

43,525. So that, with the addition of this you get the figure of 19 millions?—Yes.

43,526. You only increase your non-perennial area in cases where no perennial water is available. Can you make your non-perennial irrigation pay?—(*Mr. White*): It entirely depends on what rates are to be levied.

43,527. But you expect to be able to charge sufficient rates to extend non-perennial irrigation and make it pay?—(*Mr. Smith*): Under the present arrangements it will not pay; in fact, you cannot make it pay.

43,528. Are your non-perennial areas chiefly in the East of the Province?—No, I should not say in the east of the Province; I should say that they were very largely in the south along the Sutlej, perhaps towards the central south-west.

43,529. Is this new feeder running eastwards through Patiala perennial?—Yes.

43,530. Is the Rohini Bhatinda feeder also perennial?—It is under the Bhakra scheme, and therefore it is perennial.

43,531. So that you are making considerable progress towards providing perennial irrigation in the east of the Province?—We want to make progress.

43,532. Are these not sanctioned?—No, they have not yet been submitted.

43,533. Does that come into your 19 million figure and not the 14 million figure?—Yes; but the trouble is to make them pay, because they are schemes of storage supply which must necessarily be very expensive, whereas the ones which you have just been mentioning are non-storage schemes.

43,534. And this will go into an area which is more subject to scarcity or famine than the rest?—Yes.

43,535. So that you advocate them on the ground of protection to the people?—Yes.

43,536. Is irrigation in the Dera Ismail Khan district towards the frontier under your department?—No; they have a separate Irrigation Department.

43,537. Is the Paharpur canal, for instance, under your department?—No, it is under the North-West Frontier Province.

43,538. You cannot say whether they come in any way under the schemes for further development out of the Indus?—They have intentions in that direction and have been carrying out surveys.

43,539. To turn to the question of drainage: some years ago the Karnal District was severely waterlogged. Have you any district records to show by what methods that waterlogged area has been reclaimed or ameliorated? Was that done by your department?—(*Mr. Smith*): I do not know that anything special was done except to open up some lines of drainage to cut

off loops of the old arm of the river into the canal; those were straightened out and irrigation was spread over a larger area by the construction of the Sirsa branch of the Western Jumna Canal.

43,540. *Mr. Calvert*: Did it not realign the Jumna?—Not the upper reaches, which are still there. I think that the real reason why waterlogging there has largely disappeared is that the same amount of water which thirty or forty years ago used to be spread about in the low-lying areas has now been spread over a much larger, a much drier and a much higher area.

43,541. *Sir Thomas Middleton*: By administrative improvements?—By the construction of the Sirsa Branch.

43,542. *Sir Ganga Ram*: Probably by the realignment of the canals?—Probably so of the branches.

43,543. *Sir Henry Lawrence*: Not much was done in drainage?—A certain amount was done in drainage, but I do not think the drains were responsible for the improvement.

43,544. *Mr. Barron*: Were there not a number of old drainage channels which had silted up on the Western Jumna?—Yes, there was a lot of drainage done, but I do not think that the results were produced mainly through that.

43,545. *Sir Henry Lawrence*: Has there been much improvement in the matter of malaria?—A good deal of improvement.

43,546. *Mr. Barron*: The difficulties, I take it, were reduced by the fact that there were these natural drainage channels there?—Yes.

43,547. *Sir Henry Lawrence*: Has anything been done in the way of pumping water from wells?—No, they may have lifted water from the percolation wells; when we reduced the amount of canal water in the older tract they may have raised water from the percolation wells by the ordinary village methods.

43,548. Then as a result of these changes the agricultural prosperity has improved?—Decidedly; one thing must be borne in mind and that is that on the Western Jumna canal you irrigate about 40 per cent. of the total area; on the Upper Chenab and the Lower Chenab and Lower Jhelum, where the waterlogging problem is more serious, we irrigate 100 per cent.

43,549. Is that because you do not issue more water from the Western Jumna Canal?—We have not got the water to let them do anything more.

43,550. How did the waterlogging take place in the first instance?—There was no Sirsa branch to start with, and the water ran in ill-designed channels. They used the old, tortuous *nullah* beds which existed naturally. The running of the larger supplies in the more badly-aligned channels led to waterlogging.

43,551. Did the experiments which were made on these lines twenty or thirty years ago contain any lesson you could apply in the rest of the Punjab?—One main lesson was with regard to surface and sub-surface drainage. There they had the natural outfall to the river; here that is our difficulty.

43,552. *Sir Ganga Ram*: Mr. Wilsdon, have you arrived at any mathematical formula by which you can say how much of the total water received on the land is required for crops, how much is evaporated, and how much goes into the ground?—(*Mr. Wilsdon*): The only conclusion I have been able to arrive at is a statistical conclusion obtained by the examination of a large number of records, and that only tells us the quantity of

water which will reach the subsoil level for a given irrigation of the surface. For every inch put on the land, one-third inch will reach the subsoil water-table.

43,553. My own village, Gangapur, was founded in 1903. When the first well was put down the water-table was 103 feet below the surface; now, after 24 years, it is 40 feet. Are you able to derive any conclusion from that?—At the present time our investigations have been chiefly confined to the Upper Bari Doab, because there we have a longer record

43,554. On pages 435-6 of Mr. Chopra's note he gives figures for the delta of water required for each crop. Do those figures include the rainfall?—(*Mr. Chopra*): The figures are not put in that form, but from the context it will be seen that I am dealing with the physical requirements of water as understood by the zamindar, and they include all sources of supply.

43,555. They only refer to the canal water?—To all sources, but in terms of canal water. So that the figures show the zamindari delta of canal water.

43,556. Then it is difficult to make use of them, because the amount of rainfall varies considerably in different districts?—These observations were made in an area of average rainfall.

43,558. What is the rainfall there?—Twenty to twenty-five inches.

43,559. In Montgomery we have only eight or nine inches?—Yes. I used those figures to illustrate the problem before me; that is all.

43,560. Could you give us any figures which would include rainfall, and which would show us the total quantity of water required to mature each crop, so that by deducting the rainfall of any particular area we may arrive at the correct delta for any given crop?—My problem here was to show the wastage of water in April, May and June.

43,561. There appears to be great variation in these figures in different Provinces. The figure you give here for sugarcane is 4·4, and for rice 4·3, which means about fifty inches?—Yes.

43,562. In Bombay they use one hundred and forty inches?—It looks as if they were wasting their water there.

43,563. But if we put these figures of yours before people in Bombay, they will say that their rainfall is smaller than yours?—I have here some figures for Sind, where the rainfall is small. In 1915-16 on the Sattal canal to a certain rice field they gave fourteen inches of water on 19th July, six inches on 20th, another six inches on 21st, followed by seven inches on 27th. Rice does not want all that water.

43,564. That is not the criterion. We want to know the quantity of water required for each crop, whether it is supplied by rainfall or irrigation?—For rice the figure is in the neighbourhood of forty-six inches, including rainfall.

43,565. Including rainfall, does sugarcane require more than fifty inches?—No.

That is very important.

43,566. *Mr. Kamat*: Do you know the nature of the Bombay black cotton soil?—I have seen it.

43,567. Has the nature of the soil anything to do with the amount of water required for sugarcane?—Yes. I do not know how much more water black cotton soil needs.

43,568. Is it likely that it will require more water than the soil here?—If percolation from that soil is less, it should require less water.

43,569. Until the question is studied on the spot with reference to that particular soil, is it any use guessing at the amount of water required in Bombay?—What I have said refers to Sind, not Bombay.

43,570. *Sir Ganga Ram*: Do you not think black cotton soil is more retentive of water?—I do not know.

43,571. In the Punjab you allot water according to a certain formula, irrespective of what crop is raised?—Yes.

43,572. In Bombay it is the other way about; people apply for so much water for sugarcane, and the water is allotted accordingly?—(*Mr. Smith*): They may have an unlimited amount of water; we have an unlimited number of cultivators.

43,573. *Mr. Kamat*: Here again may I add that a man in Bombay does not necessarily get as much water as he applies for; there is a scramble for water?—(*Mr. Chopra*): An exception from the ordinary rule in the Punjab is made in an area where only rice is grown.

43,574. *Sir Ganga Ram*: But you do not differentiate there between one plot and another; the arrangement applies to the whole region?—(*Mr. Smith*): It is a special case and special arrangements are made.

43,575. *Mr. Roberts*: You give extra water for vegetables and garden crops?—Yes.

43,576. *Sir Ganga Ram*: On the Western Jumna canal the demand has much outgrown the supply?—Yes.

43,577. Cannot you augment the supply there by the battery of wells to which the Chairman referred? Would it pay you to do that?—It probably would, but if we were to put down tube-wells we would probably start first in the area where they are more urgently needed, the Upper Chenab tract, where they are wanted to save the land from being ruined.

43,578. Are there any swamps left there now from which you can pump and so augment the supply on the Western Jumna?—None.

43,579. Are you confident of that?—There may be one or two shallow *jhils*, but that is all.

43,580. Is one of the reasons why you are encouraging non-perennial irrigation the fact that you are afraid of waterlogging?—No, it is because we have not the water.

43,581. Do not you encourage it in preference to perennial so as to minimise the chance of waterlogging?—Where trouble from waterlogging is in sight we will probably go on to non-perennial, but we do not start with that idea; the original reason for non-perennial was shortage of water.

43,582. Lift irrigation never pays if you can get flow?—That is so.

43,583. Do you know that twenty years ago an attempt was made to stop all flow irrigation in areas where the water-level was only 7 or 8 feet down, so that people should use wells in preference to canal water?—We ought to revert to that system.

43,584. Will there not be trouble with vested interests? Is not a law required?—A time may come when it will be.

43,585. Where the water-level is within 7 to 10 feet, there might be a law to prohibit irrigation from canals?—We may come to that; I do not know that it is needed yet.

43,586. You have been pumping the seepage water into the canal on the Upper Chenab. What is the cost per cusec?—Considerable, because there is no water there to pump in those drains.

43,587. Has that pumping materially affected the condition of the ground?—No, because the drains are much too close to the canal and much too sketchy.

43,588. It has had no effect on the waterlogged area?—No, because the drains that supply the pumps are little better than surface drains; they are only 3 or 4 feet deep.

43,589. The Bikaner canal has been lined. What was the perimeter of that and the cost per mile?—I think it cost Rs.25 per 100 square feet. I cannot tell you the cost per mile.

43,590. Could you let us have figures for that, showing the cost per mile of lining a canal of a perimeter of, say, 50 feet?—Yes.

43,591. How did you arrive at the rates per cusec which you have laid down for the volumetric system?—We take a neighbouring channel run entirely by ordinary zamindars and estimate for the past five years what revenue that distributary system has paid, and we also estimate what water in day-cusecs has passed down that distributary and so get the value for the day-cusec.

43,592. In making that calculation, have you made full allowance for *kharaba*?—You can have it either with or without *kharaba*. In this particular valuation we have made we have allowed no *kharaba*.

43,593. If I were entitled to six cusecs, would you allow me to take seven on those rates?—No. If you were entitled to six, that would be your maximum, and in no circumstances would we give you more.

43,594. That is the reason why the landlord does not take it, because he finds your calculations are one-sided?—We cannot give you as much as you want and let other people starve.

43,595. Within some limits, cannot you give an increased quantity?—No. You can take as much as you are entitled to, but no more.

43,596. As much as I am entitled to according to that formula?—Yes.

43,597. Does that formula take into account the length of the channel to the field and the consequent loss of water?—We estimate this at the head of the distributary.

43,598. A man may have to take the water four miles to get it to his fields?—That is nothing to us. (*Mr. Chopra*): No watercourse under the Act should be longer than two miles.

43,599. If a man's field is adjacent to the channel he will get more benefit?—Ordinarily the *chak* of a watercourse starts from the distributary; in any case, the watercourse to the field should not exceed two miles in length, and two miles is not the average but an exceptional case.

43,600. Do you give any concession to a man who keeps his water outlet in good order as compared with a man who does not?—(*Mr. Chopra*): Under the Act if it is in bad order we close it until it is put right, but in the Punjab the watercourses are usually in good order; there is not much difference amongst them.

43,601. In Madras no acreage rate is charged; the Settlement Officer determines the rate according to the condition of the land. The land is divided into wet land and dry land. The Canal Department has nothing to do with the assessment or collection of rates; the Revenue Department does all that?—(*Mr. Chopra*): There are three different systems that I know of in India. In some Provinces, as the Punjab, the Canal Department does the assessment and the Collector collects the money, in others, as Bihar, the Canal Department both assesses and collects, and in others again, as in Madras, the Revenue Department does both.

43,602. After paying interest charges and so on, is a certain proportion of the revenue from canals earmarked for the improvement of irrigation, or does it all go to general revenues? On the Lower Chenab Canal you are making 30 or 40 per cent. Does any of that go towards the improvement of irrigation by being specially earmarked for that purpose?—No, it

all goes to general revenues, but we are given as much money as we can show there is need for. Nothing we ask for for an essential work is ever refused.

43,603. In paragraph 53 of the Report of the Irrigation Commission (1901-2) they say that 87 per cent. of the total surface flow passes to waste in the sea. Has any improvement taken place in that position since the Commission wrote its Report, so far as the Punjab is concerned? They must have made their calculation Province by Province and then arrived at the total for all India. Do you know whether the position has greatly changed in this Province?—On the completion of the Sutlej scheme we will be drawing off more than double the amount of water we were getting at the time of the Irrigation Commission.

43,604. With regard to Colonel Cole's complaints, do you think the position of the zamindar will be improved if the functions of the irrigation *patwari* are given to the revenue *patwari*?—(*Mr. Smith*): It is no use our saying anything about that. You have the record of the last 30 years.

43,605. Taking a cross-section of the Punjab, the fall of the country is from N.E. to S.W.?—(*Mr. Wilsdon*): Yes.

43,606. Does the water-table follow the contour closely?—No, there are extraordinary variations, particularly under the Western Jumna system and again towards the north. There is a rise of the subsoil water-table, of course, towards each river valley.

43,607. Are there any scientific reasons for that phenomenon?—I have a theory (which remains to be proved) that we have a subterranean mountain range. We are taking steps to substantiate that by a survey to determine definitely whether there is any rock mass holding up water in the soil.

43,608. *The Chairman*: Submerged by blown sand or by river-carried silt?—By river deposits. These outcropping rocks are all of the old Deccan system, and quite distinct from the Himalayas.

43,609. *Sir Ganga Ram*: Have you sufficient information to give me a cross-section?—I can give you a cross-section of the water-table from Delhi to Kalabagh, on the Indus.

43,610. I ask you that question because of an idea which has occurred to me. Is there no possibility anywhere of doing the Kaerez system of irrigation, as is done in Baluchistan? There the slope of the water-table is less than the slope of the country, and therefore by excavating or tunnelling it is possible to bring the water-table to the surface?—There is not the slightest hope in this alluvial soil.

43,611. But in that you can dig a canal instead of tunnelling?—A drain is only another form of the same thing; we can do it by digging drains

43,612. In one part of Patiala I found that by simply excavating a canal the water-table came to the surface; there was a difference of three feet only. Are there any indications of that sort of thing in parts of the Punjab?—In the waterlogged tracts. It would want a steep gradient to make it worth while to get water in that way.

43,613. *Sir Thomas Middleton*: Mr. Wilsdon, you have drawn prominent attention in your précis of evidence to the relations between the University and scientific research in this country. The position is this, I take it: research in connection with agriculture has hitherto been more or less an exotic and under those conditions it has been essential that the workers engaged should be official workers. You desire to see the development of indigenous research in the Indian Universities and you wish to promote the interest of the non-official worker; is that your position?—(*Mr. Wilsdon*): I am mainly considering fundamental scientific work.

43,614. Yes, I am now referring to fundamental scientific work. You agree that the Indian Universities are capable of fundamental scientific work; you have given instances yourself?—Yes.

43,615. You point out that the best work so far has been particularly noticeable in physics and chemistry?—Yes.

43,616. Can you indicate any reason why the biological sciences should not have received similar attention in India?—I do not think I should be correct in saying there has not been equally valuable work done in the biological sciences; I probably mentioned physics and chemistry because they have come more to my attention; I would not say there has not been as valuable work done in the biological sciences.

43,617. We have generally found, in places we have visited, that physics and chemistry received more attention than biology, it occurred to me that the facilities which are required for the biological sciences, field laboratories, and so on, are very often absent from Indian Universities?—Perhaps so.

43,618. I noticed in one place, not an Indian University, an endeavour to develop work in bio-chemistry was being held up by the need of the most elementary facilities for field studies. What you desire is that there should be some system of administration which would take into consideration the needs of the Universities at the same time as the demands of the official workers come forward for grants for research?—Yes.

43,619. You want an independent body?—Yes.

43,620. And you agree that if research is to make any considerable and substantial advance in India it must be in connection with the Indian University?—I feel convinced of that.

43,621. Why do you say that valuable work on base exchanges in soils has been published, "singularly enough" in connection with Calcutta?—Calcutta struck me as being a place rather divorced from agricultural interests.

43,622. You know no doubt that research work on base exchange has been occupying a great number of pages in scientific journals for the past four or five years?—Yes.

43,623. I met at Calcutta University a very experienced chemist and it seemed to me to be not surprising that he should have seized upon this problem?—Yes, that is the sort of thing one wants to encourage.

43,624. Undoubtedly, what seems strange is that more work of this type bearing on agriculture has not attracted workers in Indian Universities?—That is right.

43,625. Would you agree that agriculture presents many problems for workers in fundamental research at the Indian Universities which at the present time are being neglected?—Yes, in almost every science.

43,626. To come to another point; you are using Etvo's torsion balance here?—I have an assistant being trained in the use of it and hope to start a survey in a few months.

43,627. What is the specific gravity of the rocks which you propose looking for in Sind?—The specific gravity of the rocks I am considering is, I think, about 3.

43,628. Is it as much as 3?—Yes.

43,629. Are you in touch with the work that is being done in Persia on the use of this balance?—Is it Dr. Pekar of the Institution at Buda Pesth who did it in Persia? I am in touch with the work which has been done is Assam and near the delta of the Indus; a survey has been made there.

43,630. There is an enquiry going on in Persia at the present time?—I am not aware of it.

43,631. Your own work here is specially on the drainage question. You make the remark: "No new agricultural research institute should be built outside a University centre." I would almost have been disposed to agree, except in connection with such investigations as your own. I do not quite see how you can avoid going into the wilderness, if I may put it in that way?—Yes, I quite agree, but you need go into the wilderness only for your sub-station.

43,632. You must take into consideration evaporation, rainfall, the actual character and structure of the soil, and so on. I think you have got one central station at the present time?—Yes.

43,633. How far will that take you? When do you think of starting sub-stations?—Very soon; we have got one sub-station at Chakanwali; we shall have to start drainage on a large scale very soon; but we shall have to make experiments before we can put up a scheme.

43,634: As a preliminary to the starting of these stations, has there been anything in the nature of a survey of the district?—I have been mainly concerned with waterlogging. Before I choose a place I, of course, survey the soil and choose what I think is the most representative place to try. The site is also determined by the necessity of having a drainage outfall.

43,635. In Britain the conditions of the soil as regards drainage vary very rapidly, rarely over an area of 100 acres would you get similar conditions?—Quite.

43,636. I take it that in the Punjab elatively wide areas are of the same character, and would therefore require the same kind of treatment?—That is so.

43,637. Is not this a case in which something in the nature of a systematic soil survey should be taken up at an early stage?—The difficulty there is that one has to go fairly deeply into the subsoil; there have been proposals put forward for a systematic surface soil survey in the Province from the agricultural point of view; but from our particular point of view we know the places where we have got to do the drainage and we have got to find the best way to do it.

43,638. You mean that your borings have got to be so deep that this systematic survey would be a slow business?—Yes, very slow.

43,639. To what depth do you think you will have to bore?—If you are designing a drainage system, a drainage gallery, as you may call it, you have to go down 12 to 15 feet; if you are thinking of pumping you may have to go down 100 feet.

43,640. The agricultural difficulties arise very largely in the first five or six feet?—Yes; there of course the first two or three feet is quite enough.

43,641. And the work could be done by the soil auger?—Yes.

43,642. *Mr. Barron*: The Commission has heard a great deal about the co-ordination of work between the various departments but I think an important agency that you have in the Engineering Service has not been mentioned. You have a Punjab Engineering Congress have you not?—(*Mr. White*): Yes.

43,643. It meets every year?—Yes.

43,644. Can you tell me how many years it has been meeting?—Fifteen.

43,645. It is attended by engineers of all the branches, is it not?—Yes, Railways, Roads and Buildings, and Irrigation.

43,646. Is it also attended by private engineers?—Yes.

43,647. Contractors who are doing work for you?—Their agents.

43,648. Agents of engineering firms?—(*Mr. Smith*): Yes, but they must be trained engineers.

43,649. You only allow qualified engineers to be present?—We have not so far allowed any other to be members.

43,650. Do you find the work done at this Congress valuable?—Very valuable.

43,651. I believe you have discussions not only on practical problems but on scientific questions too?—(*Mr. White*): We have discussions at the meeting and elsewhere during the Congress week.

43,652. On what kinds of subject do you have papers read?—Practically on all subjects: waterlogging, outlets, designs and so on.

43,653. Do you think more valuable results could be obtained from this Congress than are at present obtained?—(*Mr. Smith*): A number of men do not find time to collect their data which they have in various books and publish them; it is also a race to get the data which one wants to offer put up in time for the Congress.

43,654. Does the Congress help in the publication of papers?—Yes, the Congress does it all; we simply put it up in typed form.

43,655. Have you got a grant?—No, we get no grant; it is all done by subscription amongst the members.

43,656. You have no Government grant?—No.

43,657. Has it ever been applied for?—No, it has never been applied for.

43,658. Do you think you ought to get a grant or do you not want one? Perhaps you prefer not to have it?—Anything that could be done in the way of furthering the amount of research that members go in for individually should be done whether it is by way of a money grant or a research officer or secretary; anything like that would further the interests we have and would be welcome. We have heard a lot about outlets; we devoted a whole morning in the last session to the consideration of outlets and weirs which have to distribute the water more or less proportionately; that is the pressing problem that we have got ahead of us and any help received would be invaluable.

43,659. You think you might get a grant from Government to help you with that?—Any help that Government can give in that respect, whether it be monetary or the services of an officer, would be welcome. I am of course speaking for myself and not for the whole Congress.

43,660. Do you think the Congress has ever considered applying for it?—No, they have not; we could of course put it before the Council.

43,661. It might be a thing worthy of the Council's consideration?—I think so, very much. (*Mr. White*): It has not been suggested probably because it was thought that there was no chance of getting it.

43,662. Perhaps the Commission might suggest that you should get some assistance?—(*Mr. Smith*): I think it would be very welcome.

43,663. *The Chairman*: How would you budget for a large protective scheme of drainage; would that be within your own budget or would you charge revenue in the ordinary way?—It would go against our own revenue.

43,664. So that the 15 per cent. net profit on the taxpayers' investment might be somewhat reduced by any improved scheme of protective drainage?—It is almost certain to be reduced.

43,665. Are you satisfied with the present classification as between productive and unproductive schemes is sound within the public interest?—No, I do not think it is.

43,666. Will you tell us shortly why you think that?—No new scheme can be productive now if we are bound by the rigid technical rules of productivity.

Messrs. White, Smith, Wilsdon and Chopra.

43,667. Is any allowance made for the indirect enhancement of revenue as the result of irrigation?—Yes we get a certain amount of indirect credit, but it is not enough.

43,668. Is that where the present classification is at fault?—It is at fault in this way, as we have found in two of these big schemes, the Bhakra Dam particularly, that the rates that we could charge would not permit of the scheme being a productive one within the meaning of the definition.

43,669. You think you would persuade the cultivator to pay higher rates than you are allowed to charge?—He would pay higher rates once he finds the economic pressure getting at him; but at present he does not realise that.

43,670. Do you suggest that these rules should be amended?—I do.

43,671. Do you agree with that, Mr. White?—Yes.

43,672. Have you ever made proposals to the Local Government on that?—(*Mr. Smith*): A certain Circle was finding trouble in this matter and we represented that we could not do it within the rules laid down under the Code, and the Government said that if we could not do it productively we must do it protectively.

(The witnesses withdrew.)

Mr. C. M. KING, C.S.I., C.I.E., I.C.S., Financial Commissioner, Punjab.

Replies to the Questionnaire.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*c*) In the Punjab the credit of cultivators who are owners of land is already restricted by the operation of the Punjab Alienation of Land Act, 1900. There is no restriction on the credit of cultivators who are not owners. The ordinary tenant not owning land does not, however, possess much credit, and I think it quite unnecessary to restrict what little credit he has any further. He obviously cannot sell or mortgage anything in the shape of agricultural land because he does not own it. There is, however, a considerable class of tenants who own small fragments of land and who are able to use that land to raise money. Their credit so far as it relates to the land is also restricted under the Punjab Alienation of Land Act. It should be noted that the effect of the Punjab Alienation of Land Act is to restrict sale or mortgage by members of agricultural tribes. Persons who are not members of these tribes have full rights of sale and mortgage. For the persons belonging to these tribes, as they have a shrewd idea of the value of their property, it is not necessary to take special measures to protect them by restricting or controlling their credit. Indeed, I am of opinion that they would probably resent it, if any measures were taken.

There remains the question whether a member of an agricultural tribe should have his credit further restricted by any rules prohibiting or limiting the right of mortgage and sale with respect to a member of the same tribe or group of tribes. It has often been urged that although the Punjab Alienation of Land Act has had the effect which it was intended to have of preventing land from passing from the hereditary agricultural castes to other castes, it has not really helped the hereditary agricultural class to decrease their indebtedness. This criticism implies that whereas the agricultural tribesman used to become indebted to a man of the moneylender class before the Act was passed, he now becomes indebted to the same extent to a member of his own tribe or group of tribes and it is alleged that he usually finds this new class of moneylenders to be just as avaricious and hard as a member of a hereditary moneylending caste. There are undoubtedly cases where this has happened, but as a general rule, I think, it

may be asserted that there is no sign of a general expropriation of any particular caste or tribe by any other caste or tribe. Such enquiries as I have made indicate that where, owing to indebtedness, a member of an agricultural tribe has to sell or mortgage his land, the reason for his doing so will be found to be sheer incapacity to get as much as he can out of the land. I do not remember any such case in which there has been a demand by members of agricultural tribes for protection against their fellow tribesman or tribesmen belonging to the same group. I do not think that the extension of the principle of terminable mortgages beyond the scope of the Punjab Alienation of Land Act is necessary.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*b*) I am generally in favour of economic surveys being made in villages, but I would prefer that these surveys should be conducted by non-official bodies. The scope of such enquiries should be as wide as possible. It is to ascertain every single fact which is in any way relevant to the economic well-being of every inhabitant of the village. Such enquiries have been conducted by the Board of Economic Enquiry (Rural Section), Punjab, with the aid of young men who have been given temporary appointments as investigators. I am of opinion that the usefulness of these enquiries will be greatly extended if we were able to establish under the auspices of the Board a band of trained investigators. Hitherto, in spite of all efforts, the enquiries have failed some time to attain that scientific precision which is desirable to such enquiries, the reason being that the investigator himself lacks experience and very often education and training sufficient to make him a satisfactory scientific investigator.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*c*) I have myself only conducted one such enquiry, and it is difficult from a single example to enunciate broad conclusions. At any rate, I am unwilling to do so.

QUESTION 26.—STATISTICS.—(*a*) (*i*), (*iii*), (*iv*), (*v*) We have a very good system of statistics in the Punjab and I have no suggestions to make for its extension and improvement.

(*ii*) I think that something should be done under the auspices of the Agricultural Department to ensure the more correct estimation of the yield of various kinds of agricultural produce. Our present arrangements for obtaining this class of statistics are very inferior. The matter is left to revenue officers, but except at settlement the results obtained are not, in my opinion, trustworthy, and even at settlement it is doubtful whether any reliance can be placed on the results obtained by the revenue officers entrusted with the duty of making these estimates. The whole question should be taken up systematically by officers of the Agricultural Department.

QUESTION 26.—STATISTICS.—(*b*) I have no other suggestions to make.

Oral Evidence.

43,673. *The Chairman*: Mr. King, you are Financial Commissioner, Revenue Department, Punjab?—Yes.

43,674. We have your note of evidence. Is there anything that you would like to add to that statement at this stage?—No.

43,675. I think you are responsible for the preparation of a certain amount of the material in the memorandum which has been sent to the Commission?—Yes.

43,676. Will you turn to page 219 of that memoraudum* which gives us some information showing the extent to which *taccavi* advances have been made between and including the years 1905-1924; those figures do not suggest that *taccavi* is very popular. Do you think that *taccavi* fails to attract the cultivator?—There are two kinds of *taccavi*, *taccavi* for land improvements and *taccavi* for seed grain and bullocks.

*Memorandum prepared by the Punjab Government for the Commission (not printed).

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43,677. I am referring to *taccavi* of the Land Improvement Loans Act type?—I do not think that it is as popular as it might be.

43,678. Have you anything to say on that point?—No, I have no special suggestions to make. Personally I am rather inclined to the opinion that these *taccavi* advances ought to be kept separate, that we should work much more through co-operative societies than directly. I think that we are competing with the co-operative societies with regard to these advances, and that, I think, is wrong.

43,679. So that you deplore this competition?—Yes.

43,680. In answer to Question 6, paragraph (*c*), on page 471, you say that persons not belonging to the agricultural tribes would probably resent any special measures to protect them by restricting their credit. Have you had any indications of that resentment?—There is no special reason that I have got for that except that there is a general feeling among the non-agricultural classes against the Act.

43,681. On page 472 you suggest that economic surveys should be carried out by non-official agency. Why do you prefer non-official agency?—I had in my mind something which would be absolutely independent of Government, because I find that, in this country at any rate, people are inclined to suspect any sort of inquiry carried out by Government. I thought that if you had a completely non-official body to make such an enquiry on scientific lines that that would be less open to suspicion and therefore the results are much more likely to be valuable than would be the case otherwise.

43,682. To what extent, if any, are you responsible for the conduct of the Board of Economic Inquiry?—I am Chairman of the Rural Section of the Board. I am appointed by name.

43,683. How is that Board financed?—Almost entirely by a grant from Government.

43,684. Lapsing or non-lapsing?—Non-lapsing; we get the savings of one year carried over to the next year.

43,685. Do you think that method of financing provides the Board with that degree of security for its future which is required in order to enable it to undertake important surveys which are likely to last for a number of years?—No, I do not think so; but what I should like to do is to get the public interested and the more wealthy men of the Province to give gifts to the Board. The sort of thing which I have in mind is something in the nature of the Rockefeller Trust.

43,686. Do you see signs of the public being willing to support this?—Not so far.

43,687. Has any attempt been made to educate public opinion in that matter?—Only by our publications; no more than that.

43,688. You point out that in spite of all your efforts enquiries have sometimes failed to attain that scientific precision which is desirable in such enquiries, and the reason you give is that the investigator himself lacks experience and very often education and training. Do you think an enquiry by a non-official body would be likely to supply those qualifications? —I think myself that if we developed at all on the lines of the Rockefeller Trust we should be able to get hold of the necessary investigators for such an inquiry.

43,689. Do you attach great importance to these economic surveys and inquiries?—Yes; on the whole I think that they give us very valuable results. We have done only a few so far and it is rather too early to say, if the results are always valuable, but so far as one can see the results are always most interesting.

43,690. So far they have in no way moulded the policy?—No, we have not gone far enough for that yet.

43,691. On page 472, in answer to our Question 26, you suggest that the Agricultural Department in order to ensure a more correct estimation of the yield of various kinds of agricultural produce might take certain steps. Are you there suggesting an extension and improvement of crop experiments?—That is what I had in mind; I do not think that we make nearly enough crop experiments to know what the outturn of fields is.

43,692. One more question about co-operation: Do you form the view from your experience that there is likely in the near future to be a substantial increase in the number of cultivators obtaining their short-term credit from co-operative societies?—I have nothing to do with co-operation directly, so that I find it a little difficult to answer that question; I cannot say how far they have gone.

43,693. *Sir Ganga Ram*: May I know what you count upon as the gross value of the crops per acre in the irrigated area, the canal irrigated area, the well irrigated area and in the *barani* area throughout the Province?—I have not made any estimate at all. It varies very much from one district to another.

43,694. Is it about Rs.60 per acre in the canal irrigated area?—I should think it is very much more than that, but without sitting down to any concrete case I could not tell you definitely, because I consider it most dangerous to work out averages for the whole of the Province in that way.

43,695. What share of the gross produce do you take as land revenue?—That also varies very considerably.

43,696. What is the basis of calculation?—The basis is the net produce, which is calculated on the rental.

43,697. The reason why I ask you this question is that certain evidence which we have had before us in the United Provinces is to this effect: New settlement rules on much more liberal lines are about to come into force and mark another advance in this direction. Under them the land revenue will be as low as about 2 per cent. of the annual value of the produce. Do you accept that statement for the Punjab?—I should think that that was an under-estimate; in some parts where the settlement is expiring we are very near 2 per cent.

43,698. Would it be as low as 2 per cent.?—Where the settlement is about to expire you might get to as low as 2 per cent., but that is very rare.

43,699. You know that according to Lord Curzon's land policy the Government of India say that Government's share is one-sixth of the gross produce and it is always stated in the official reports that they do not take anything like one-sixth per cent., which means 16 per cent. of the gross value?—Yes.

43,700. The United Provinces Government say that they take as little as 2 per cent.; I could not believe that, and I thought that in the Punjab it was more than that?—Generally speaking (and I do not want to bind myself down to this figure because it varies considerably) I should think that it was more likely to be 5 per cent. of the gross produce than 2 per cent.

43,701. Could you give us figures showing how much of the gross produce goes to the tenant and how much to the landlord? Can you work it out to the figure of, say, 100?—Very well; I shall send the figures to you afterwards.

43,702. *Mr. Calvert*: Mr. Findlay Shirras puts the gross produce in the Punjab at 226 crores?—Our land revenue is 4¼ crores, so that it would

come to just about 2 per cent. if you assume 226 crores as the gross produce.

43,703. *Sir Thomas Middleton*: Reference has been made to the fact that *taccavi* is not freely taken for land improvement. What is your maximum term of years for which you grant *taccavi* for wells, for example, in the Punjab?—Normally it would be not less than twenty years.

43,704. The term in which the loan is repayable must have a very considerable influence on the man who is trying to make up his mind whether to dig a well or not, and the longer the term of years the better it is from the cultivator's point of view?—Of course, he would have to pay more interest in that case.

43,705. But when the period during which he can make repayment is lengthened his annual burden becomes less?—Yes.

43,706. Has it ever been represented to you that loans for 20 or 25 years are desirable?—No, it has not been represented to me.

43,707. The division which you have here in the Punjab between an agricultural and a non-agricultural tribe seems to be an artificial one. Supposing a man who does not belong to an agricultural tribe has been cultivating land and his father and grandfather before him have been cultivating land, is he still not to be treated as an agriculturist?—Not unless he belongs to a notified agricultural tribe. He used to be before the law was amended, but he is not now.

43,708. So that there is no possibility of any one born in the Punjab becoming an agriculturist who is not an agriculturist already?—We do not call them agriculturists; we call them members of an agricultural tribe.

43,709. But they are differently treated, the members of the non-agricultural tribes are treated rather better than those belonging to the agricultural tribes? They are not restricted in the purchase and sale of land?—They are quite free to sell land, but they can never purchase land except from members of non-agricultural tribes.

43,710. Do they regard themselves as being discriminated against?—They have attempted to regard themselves as not being treated fairly as members of non-agricultural tribes because they cannot purchase freely from members of agricultural tribes; that, of course, was not the object of the Act, which was intended to restrict the right of sale by agricultural tribes and not the right of purchase by any other tribe.

43,711. Which department in the Punjab is responsible for the collection of statistics and the provision to the Government of India of the statistics which they publish?—The Revenue Department; we have a Director of Land Records.

43,712. Not the Agricultural Department?—I mean statistics connected with ownership and areas, and so forth.

43,713. The statistics which relate to estimates of produce are made by the Department of Land Records in consultation with the Department of Agriculture?—Yes, the Department of Agriculture really do that part of the work.

43,714. *Mr. Barron*: On the matter of *taccavi* loans, can you say whether there has ever been any difficulty in getting money from the Government in order to grant these loans to agriculturists for land improvements?—No; no difficulty has ever been brought to my notice.

43,715. If you turn to the second of the two statements, page 220 of the Government memorandum,* and look at the figures of the last five years, you find there is a considerable elasticity in the present system?—Yes; for seed and bullocks he can obtain as much money as he requires.

*Memorandum prepared by the Punjab Government for the Commission (not printed).

43,716. In a bad year, for instance in 1921, about 35 lakhs were advanced, and in 1922 about 20 lakhs. The normal amount required by the agriculturist is something between 4 and 5 lakhs a year and in a bad year the Government does come to his assistance very much?—Yes; we not only give him the money but we increase the facilities to obtain the loans. We have peripatetic officers of the Government going about among the villages and making special arrangements to reach the people who require them.

43,717. The money is made over by this officer practically with his own hands?—Very largely.

43,718. And the opportunities for the understrappers to peculate are less?—They are absolutely diminished. In fact, the greater the necessity for the *taccavi*, the less are the chances for peculation, because there are special arrangements.

43,719. *Sir Henry Lawrence*: You think there is no leakage?—I do not think there is leakage. Under the rules we have laid down there is no chance of leakage. The officer goes to the spot, the people come up to him and they are paid on the spot by him practically from his own hands.

43,720. What percentage of the capital required by the ryot is actually supplied by the Government under the *taccavi* system?—On seed and bullocks?

43,721. To incur expenditure for his harvest?—I think a very small proportion, because you have got to take his other expenses.

43,722. You think that 3 or 4 lakhs is the amount required by the agriculturist?—It is the normal demand. In bad years, when we make special arrangements, it goes much beyond that.

43,723. That is 30 lakhs, is it?—It is confined to two or three districts only.

43,724. Why?—Because these are the two or three districts where the conditions were bad and special arrangements were made. Out of these 34 lakhs, I should think 20 lakhs went to one district, Hissar.

43,725. *Mr. Barron*: We were told by one witness that it took six months to get a loan for constructing a well. With your experience as a District Officer, would you say that that period is correct or is it exaggerated?—I should think it is greatly exaggerated.

43,726. *Sir James MacKenna*: Under the Alienation of Land Act the definition of agricultural tribe is a matter of notification by the Local Government. Do you know what principles are followed by the local Government in defining the members of an agricultural tribe? Have you defined the tribes in the province?—The real difficulty is on the border line. There is a great mass of people who are agriculturists and there is no question at all about them; there are others about whom there is no doubt, but that they are non-agricultural tribes; but there are some people who are just between the two, for instance, the Brahmins. Some of the Brahmins in parts of the province are gazetted as an agricultural tribe and in a greater part they are not gazetted as an agricultural tribe; so also with the Saiyads there is some difficulty. But the principle is where a tribe have been working as agriculturists and where they are being deprived of their land by people of the moneylending class, so that they cannot carry on what has become their hereditary occupation of agriculture; that is a case in which they would probably be declared as being an agricultural tribe, in order to protect them.

43,727. *Mr. Calvert*: The notification is protective?—Yes; that was the original idea of the whole thing.

Mr. C. M. King.

43,728. *Professor Gangulee*: Is it changed from time to time? Do you make your notification from time to time?—We depend a great deal on District Officers. It is not a hard-and-fast notification. At any time people may be added to the definition of agricultural tribes and people may be taken out of it.

43,729. *Sir James MacKenna*: You are in charge of settlement, I suppose?—Yes.

43,730. What is the period of settlement in the Punjab now?—Normally thirty years.

43,731. What is the basis of the assessment?—At present, under executive orders, it is one-third of the net assets; that is quite recently, within the last three or four years.

43,732. Do you actually get up to that in any of your revisions of settlement?—No.

43,733. Do you make any provision for improvement?—You mean for well sinking and so on?

43,734. Yes.—We allow for the improvement.

43,735. What is the allowance?—Twice the cost of improvement is allowed for. We allow a remission of the assessment for a period during which the man will be able to recoup himself by his increased profits up to twice the value of the cost of the improvement. I am afraid it is rather complicated. It does not depend on the land revenue, but on the income from the improvement.

43,736. In other provinces, apparently, if you manage to make an improvement in the first year of your settlement you get total remission of revenue for thirty years?—You would here. The minimum is twenty years.

43,737. *Professor Gangulee*: With regard to the definition of "agriculturist," if a man belonging to an agricultural tribe becomes a lawyer and his interest in the land ceases, is he still protected by this Act?—Yes.

43,738. Though he is no longer an agriculturist?—He is a member of an agricultural tribe.

43,739. He may be, but he is no longer an agriculturist?—That is so, but owing to the fact that he is a member of an agricultural tribe he would be protected.

43,740. If a man belonging to a non-agricultural tribe takes to agriculture, he will not be protected?—That is so.

43,741. Do not you consider these are some of the limitations in this Act?—Our object was to protect a certain class of people, and we did not seek to do more than that. We have protected them.

43,742. Amongst the agricultural tribes, do you find that if A, B, and C are members of such a tribe and smallholders, there is a tendency for their land to pass to D, who is also a member of such a tribe and a large landowner?—That is a matter which the Board of Economic Inquiry is about to investigate, but so far as I have any experience in the matter there have been only two districts in which there has been a complaint that the large landowner has to some extent ousted the small landowner. The only economic inquiry with which I had anything to do proved that that was not the case; it was a village of comparatively small landowners, with one or two men with more land than they could look after themselves, and there I found it was the larger men, who had holdings it was economically difficult for them to cultivate with the aid of their families, who were parting with land to smaller men. That was what happened in that particular instance.

43,743. But this Act does not protect the small cultivator?—It is not meant to. It was not introduced with that object.

43,744. Mr. Darling, in his book, refers to this Act and says, "The moment has perhaps arrived to exclude the canal colonies from its operation." Do you agree with that view?—I would not like to say anything about that. I imagine his idea was that people there knew too much to require protection.

43,745. He also says, "The Land Alienation Act fostered the growth of the agriculturist moneylender." Do you subscribe to that view?—I am doubtful of the truth of that statement.

43,746. This morning, one of the scientific officers of the Irrigation Branch pointed out that one of the causes contributory to the process of desiccation of certain districts in Jullundur, Ambala, &c., was the deforestation of a certain area round the base of the Himalayas?—Yes, the Siwaliks.

43,747. I think the Punjab Land Preservation Act was passed in 1900 in order to stop deforestation; it was then decided to put that large area under forest and thus solve this problem referred to by the scientific officer. Can you tell us how far that work of afforestation has been successful?—It has not been very successful, because there has been a great deal of opposition to the Act and we have not been able to enforce the Act as rigorously as it would have to be enforced in order to bring about complete reafforestation.

43,748. It is still in operation?—It has been greatly modified, and was amended in the last session of the Legislative Council.

43,749. *Mr. Calvert*: Do you think there would be much resentment if the limitation of twenty years on mortgages between zamindars and non-zamindars were extended to mortgages between zamindars and zamindars?—I should like to think that over. *Prima facie*, I think not.

43,750. Do you think the sinking of money in land improvement could be stimulated by supplying the people with more information as to subsoil water conditions, through a larger boring staff, for instance?—I should not think the mere supply of information would cause any increase in the sinking of wells.

43,751. Cases do occur where a well fails and people lose money by sinking it?—That does happen, but I do not think it is very common.

43,752. In one Province we found a Superintending Engineer appointed to work out schemes for land improvement such as minor irrigation works and improved terracing with a view to their being undertaken by the landowners with the aid of *taccavi* grants; that is to say, the initiative came from above and not from the actual cultivator?—If it was a failure, on whom did the cost fall? We have had something like that with some of our energetic Deputy Commissioners, who have got hold of a scheme and induced people to take *taccavi* to work it out, and sometimes it has not been a success and people have been burdened with the cost of the *taccavi*. Before I answer, therefore, I should like to know if Government pays the cost if the scheme is a failure.

43,753. You sometimes remit *taccavi* now in cases of failure?—Yes.

43,754. The general problem is how to stimulate land improvement. Another suggestion is that there should be in each district a whole-time special officer engaged on *taccavi* distribution in order to popularise it. Would you be in favour of that in the Punjab?—As I have said, I would prefer it to be done through co-operative societies.

43,755. We have been told that the Punjab Alienation of Land Act prohibits people belonging to non-agricultural tribes from purchasing

agricultural land. Is that correct?—No, that is not my interpretation of the Act.

43,756. There is no such prohibition in the Act?—No.

43,757. We have been told the Act prevents middle-class people from adopting the agricultural profession. Is there much demand amongst them to do so in this Province?—I have not noticed it, except perhaps at Muzzafargarh. It is a curious thing that there, in one of the poorest districts of the Province in many ways, the Hindu non-agriculturist has become the better farmer. He sinks wells and does his farming better than the Mohammedan tenants.

43,758. We are told that in defining the agricultural tribes you are moved by political considerations. Is that correct?—Not now. I think the whole Act had its origin in political considerations.

43,759. The Act, but not the notification of tribes?—In selecting tribes we look to see whether a tribe requires protection or not. We set our face as far as possible against notifying a tribe merely in order that it may acquire land from other tribes, which is really the reason for notification put forward by non-agricultural tribes.

43,760. Another proposal which has been put before us is that Government should sink tube-wells and charge a water rate from the people who use the water. Do you think that would be practicable in the Punjab?—We tried to work out one case like that in the Amritsar district, and I think the water rate came out at something like Rs.40 an acre, which was absolutely prohibitive.

43,761. *Mr. Kamat*: There are one or two other proposals which have been placed before us which affect your department and on which I should like to ask your opinion. One proposal is that in order to stimulate fodder growing and the improvement of pastures remissions of land revenues should be given to zamindars in villages. That suggestion came from the Registrar of Co-operative Societies. What is your opinion?—Your object being to increase the fodder or pasture?

43,762. Yes. How the remission was given (on a percentage basis or by a lump sum arrangement) is a matter of detail. What have you to say with regard to fodder?—We encourage fodder by charging a very low water rate, so low as to be out of all proportion to the value of the crop.

43,763. You would be against any additional concession?—I think the existing concession is sufficient.

43,764. Similarly, to encourage the enclosure of pasture land, it has been suggested that some remission of revenue should be given?—In most villages in the Punjab there is no enclosure anywhere and the cattle of the village are allowed to graze all over the unoccupied land. I do not quite see what you want done.

The proposal is that there should be proper pastures, that these should be enclosed and that cattle should not be allowed to graze all over them?—I do not quite see what the result aimed at is.

The object is fodder for cattle?—That is to say that the fodder is to be cut off this pasture land, stacked and fed to cattle afterwards?

That is a matter of detail whether it is to be cut or not?—You already have large areas in villages of what they call *chiraga* land, especially in the dry parts of the Province, in Hissar and places like that; you have large areas attached to village ponds which serve as a catchment area for the village pond and also as pasture land for the cattle; under the Land Revenue Act, that land cannot be broken up, and, as a rule, if it is assessed to land revenue at all, it is on a very nominal rate, and very often it is excluded from the land revenue of the village; we have that system in places like Hissar.

43,765. In any case, I take it you are disinclined to give any remissions in the way of concessions for those objects; is that your view?—What I have actually said is that we already assess fodder crops at such a low rate that in fact it amounts to a remission, and that in many cases the pasture land is actually free of revenue by the will of the villagers themselves. I do not think we need go further than that.

43,766. *Mr. Calvert*: No land revenue is assessed on the village common grazing ground?—In most cases it is not.

43,767. *Mr. Kamat*: Now I want to ask about revenue and the forest policy. In a statement supplied to us it has been said that on the Continent of Europe one acre of forest per head of population is the minimum to make a country self-supporting in forest products. In the Punjab one-quarter of an acre of forest per head of population is the ratio; later on we are told that the policy during the last few years has been to have irrigated plantations, planted for the growth of wood and other things?—Yes, we have got one or two near Lahore.

43,768. The remark is made here, that from the agricultural point of view, it seems not only a matter of replacing former sources of wood supply but of inducing the large agricultural population of the Province to take to burning firewood instead of cow dung. The object is that instead of burning cow dung they should have opportunities of getting wood for fuel purposes; that means that there should be a larger forest area, or that the forest plantations should be increased from time to time, so as to meet the requirements of the population on the basis I have just read out. Therefore a portion of the irrigated land should be given over to plantations. Is that policy being steadily pursued?—No, I think not.

43,769. That policy is not being carried out?—I do not think any attempt is being made to get the ratio up to one acre per head.

43,770. I do not mean that it should be followed strictly to that extent, but are increased facilities being offered with a view to increasing the wood supply?—I think in our new colonies we are attempting to arrange for wood supply.

43,771. Certain striking figures of your irrigation and land revenue indicate that the total land revenue of this Province is something like Rs.4,26,00,000?—Yes, 4¼ crores.

43,772. From the irrigation of all these colonies you are getting 3¼ crores?—Yes.

43,773. A fairly large amount of land revenue?—Yes.

43,774. That comes to something like 15 per cent. on your capital outlay; that is what we were told this morning?—Yes.

43,775. In view of this very liberal return on your capital outlay, it is obvious that you could give certain facilities in the matter of increasing forest areas for the cultivators. Is that policy being steadily pursued, or are you following a policy of getting as much revenue as possible out of lands under irrigation, without releasing land for afforestation?—In all our colonies arrangements are made for certain areas to be reserved for grazing grounds, but not for forests. On this point, of course, I am not prepared to give evidence; I can only say that in certain colonies special arrangements have been made for forest produce.

43,776. If you like you need not commit yourself on behalf of Government. But you are getting a very handsome return on your irrigation; you yourself show that one acre is the ratio of forest land required in other countries; that ratio is not maintained in this Province; therefore I suggest that your land revenue or the irrigation revenue policy ought to be liberalised so as to give the cultivator better facilities for obtaining fuel?

—Do you mean that he ought to be allowed to grow forest produce without being made to pay for it? I am afraid I do not follow.

43,777. There ought to be greater facilities for the growth of wood so that it will be easily accesible to the villager who now has to fall back upon cow dung?—Do you mean that you ought to provide him with more forest plantations?

43,778. Quite?—Yes.

43,779. You agree with that?—I will not say I agree with it.

43,780. *Mr. Calvert*: In your Land Revenue Administration Report for 1922 it was noted that the total area of the Province was 56,000,000 acres, of which 16,000,000 acres was common lands, forests and village sites?—Yes.

43,781. The common lands and forests is a very fair proportion?—Yes; of course, that includes the whole of the Kangra District and places like that.

43,782. *Mr. Roberts*: With regard to the question of remission of fodder rates in canal colonies, do you think if nothing were charged at all, there would be any appreciable increase in the fodder grown?—I do not think so; I could not say. I think it might have one undesirable result of increasing the number of unwanted cattle. The amount of fodder grown would depend on the profit.

43,783. The amount of Rs.2 at present charged is very small, and in my opinion, at any rate, the difference between the profits from fodder growing and the growing of other crops is so great that the remission of that Rs.2 would make no appreciable difference in the amount of fodder grown?—I am rather inclined to agree with you there.

43,784. If it would lead to a larger amount of fodder being produced and an increase in the number of cattle, it would be a desirable thing, would it not?—If they were good cattle it would be a good thing, but as a rule the increase has been of undesirable cattle. I have not got the figures, but I am not at all certain that you have not got actually as many head of cattle as you require; in many parts of the Province you have certainly got more cattle than you require for the needs of the area.

43,785. I believe Government is trying the experiment on the Western Jumna of assessing and collecting revenue by means of civil officers?—Yes.

43,786. Are you prepared to make any statement with regard to that?—I cannot say anything about that; certain decisions have been reached.

43,787. One witness recommended that the work should be done by the civil authorities?—I dare say some people recommend that.

43,788. *Sir Thomas Middleton*: Referring to the point raised by Mr. Kamat with regard to enclosure: you have got in the Punjab some 16,000,000 acres of common land and forest land; it has been represented to us that these common lands are largely wasted lands from the point of view of cattle improvement. Supposing it were proved that one of the chief improvements which you could make in Punjab land would be to enclose the fields, would you be prepared by remissions of revenue or otherwise to stimulate that form of land improvement? The enclosure of pasture land and of tillage land in the Punjab have both been suggested to us as being desirable?—Personally, I think it would be absolutely impossible; I am very doubtful what the law would have to say on the subject; I think it would require a legal enactment to permit enclosures of that kind, because all the inhabitants of the village almost invariably have the right

to graze their cattle throughout the area of the village where there are no crops actually growing.

43,789. *Sir Henry Lawrence*: Has the Forest Department come under your supervision?—Not under mine, under Mr. Barron's.

43,790. The financial results do not come under you?—I have nothing to do with the Forest Department; we are two Financial Commissioners; one deals with forests; I am not the Financial Commissioner who deals with forests.

43,791. You have no knowledge of the subject?—No.

43,792. And never have had?—I had; when I did the work that Mr. Barron does now, I had to deal with forests.

43,793. Perhaps from your previous knowledge you can answer one or two simple questions. Is it the business of the Forest Department to supply fuel in the plains?—The Chungamunga reserve certainly was made with the idea of providing fuel, especially for the people of Lahore.

43,794. What is the extent of the Chungamunga area?—(*Mr. Barron*): 2,300 acres.

43,795. *Sir Henry Lawrence*: There are a good many lakhs of acres under forest?—Yes.

43,796. Is it the usual practice, and is it recognised to be the duty of the Forest Department, to supply fuel in the plains?—No, I should think not, but I cannot say from my own knowledge.

43,797. That is the recognised duty in other Provinces?—I cannot answer from my knowledge whether that is the duty of the Forest Department or not.

43,798. *Mr. Barron*: Could you put it in this way: that the Forest Department, wherever it has any reserves of fuel, does collect them for sale in order to make money?—Undoubtedly; wherever they have reserves they sell to the public.

43,799. *Sir Henry Lawrence*: And does it supply wood for village industries?—Where there are forests, yes.

43,800. Is the distribution of forest area throughout the Province satisfactory in your opinion?—No, because it is all concentrated in the Himalayas.

43,801. Is it desirable that there should be forests scattered about in order to enable villagers to obtain their requirements locally?—I am not at all certain; I should not like to answer that question; I think there is a good deal to be said on both sides. If you have very good communications, as we are going to have in the Punjab, I do not think it is necessary to have local forests.

43,802. A Utilisation Circle has recently been established in the Forest Department, has it not?—Yes.

43,803. Is that concerned with the supply of the needs of the cultivators in the villages?—I think it is mainly concerned with the making of turpentine.

43,804. In the Forest Report there is no recognition of the fact that the Forest Department might concern itself with the supply of the needs of the villagers in their villages?—No; the conditions here in the Punjab are somewhat different from what they would be in the Central Provinces. We have not large areas of natural forest interspersed between cultivated villages; our cultivated lands extend right across the Province.

43,805. Conditions in this matter fall a little short of perfection; is it recognised that they do so?—That is as regards the provision of forest produce to the people?

Yes?—I should not like to answer that question.

43,806. *Sir Ganga Ram*: Are these *chiragahs* and other reserve pasture lands in charge of the Revenue Department or of the Forest Department?—So far as they are in charge of anyone, they are in charge of the Revenue Department.

43,807. But nobody looks after them?—The villagers look after them to some extent.

43,808. If they were given to the Forest Department and the Irrigation Department were asked to supply the water, would not a very useful purpose be served. If these *shamilats* and *chiragahs* could be managed in order to grow fuel for the needs of the villagers what objection would there be to that?—I can only give the Commission one example and that was up in the Kangra District. There was a great deal of *shamilat* land or forest land, amounting to something like 386,000 acres I think, and the Deputy-Commissioner found about fifteen years ago that the people were destroying the forests by putting in too many heads of cattle and too many sheep and so on with the result that the lower hills of the Kangra District were made bare in much the same way as the Siwaliks had become before that, and therefore arrangements were made for the Forest Department to run them on behalf of the people, limiting the number of sheep and putting on a higher rate of taxation and so on. It caused the most intense resentment.

43,809. That is with regard to the agency; but what I want to ask you is whether you recognise the principle that all these waste lands should be planted for fuel purposes in order to supply the needs of the villagers?—I think myself that that is a sort of thing which might very well be done by the co-operative societies, because if Government attempted to do it great resentment would be created.

43,810. I was only asking for your opinion as to the principle?—If steps were taken to improve these *shamilat* lands I think it would be a good thing As I say, any arrangement by which the people themselves could be stimulated to improve their *shamilat* land would be a very good thing indeed, but I think it would be very dangerous for Government to interfere in the matter.

43,811. You stated a little while ago that you did not take so low a percentage as 2 per cent. of the gross produce from land revenue but that the percentage was about 5 per cent.?—I do not think those were exactly my words; I said that I was not going to bind myself down to any particular figure, that I did not think that the figure was as low as 2 per cent., and that I thought it was about 5 per cent.

43,812. Would you be prepared to advise the Settlement Officers that they should base their calculations on a figure not exceeding 5 per cent.?—Certainly not. I have already explained that 5 per cent. was the very minimum limit; I am certainly not prepared to ask the Settlement Officers to assess up to that limit only.

43,813. *Professor Gangulee*: You say in your note that your present arrangements for obtaining statistics of the yield of various kinds of agricultural produce are inferior. Would you like to see an agricultural statistician attached to the Department of Agriculture?—I think that something should be done to ensure that we get really accurate estimates of the outturn of various crops.

43,814. *Mr. Kamat*: About this Board of Economic Inquiry of which you are the Chairman, I should like to know what exactly is the method of inquiry adopted? Have Government laid down standard forms?—Government have nothing to do with it.

43,815. Then how do you make your inquiries?—The Board selects a village after discussion among the members and consultation with the

Deputy-Commissioner and then appoints an investigator to collect the statistics of that particular village and that man works under one of the Members of the Board who is the member in charge.

43,816. Who fixes the heads of the statistics?—We have a questionnaire which the Board has drawn up.

43,817. Have you trained your investigators?—No, and that is one of the defects of our system. We should certainly like to have trained investigators.

(The witness then withdrew.)

Col. E. H. COLE, Coleyana Estate, Ltd., Okara, District Montgomery.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(1) Feeding value of indigenous grasses, and how to improve outturn.

(2) The discovery of a perennial leguminous fodder other than lucerne which would last three or four years. Judging from the enormous number of starving cattle and domestic animals one sees in India the provision of adequate supplies of fodder is the greatest question in Indian farming. Good fodder is the basic need of India. Until we have that we cannot plough our lands effectively, we cannot get milk for the population, nor can we improve our horses. Periodically some one takes up the question of fodder and works to the best of his ability, but the Government and public take little or no interest. What we require in the Punjab is a highly efficient specialist, working to produce a perennial leguminous plant which can be grazed or cut for fodder.

I have visited experimental stations in England and other countries with a view to get new ideas, but this is not a matter for indivdual effort. It is of national importance in India and should be dealt with accordingly. I do not mean to suggest that one fodder plant could be found to suit the diverse conditions of the whole of the Punjab, but one surely can be found or bred to suit large areas. We have numerous fodders both for *rabi* and *kharif*, many of which are very good, especially in the *kharif*, but, excepting lucerne, I have come across none that are perennial under irrigation. The annual cultivation required to produce the available fodder crops adds to their cost and moreover they do not stay long enough on the land to improve it greatly. We require something in the nature of wild white clover, subterranean clover or alsike, which can grow with the indigenous grasses and thereby increase bulk. Wild white clover is indigenous in Kashmir; some of the Australian varieties of clover might be acclimatised to suit Indian conditions. If one with greater bulk can be found such as *khudzu* or a perennial *val*, so much the better. The fodder question is of greater importance than cotton or wheat, and should be dealt with accordingly by a specialist of calibre. Such plants used with *dhub* grass would go a long way to reclaim some of the derelict land now available in irrigated tracts.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) Economic Botanists producing high yielding crops of even and good quality which put money into pockets of cultivators.

It is only by visible profits that the cultivator will improve his methods. All questions with regard to the improvement of agriculture and the arts incidental to agriculture in India call for a clear understanding of Indian cultivators. The agriculturist must not be judged by the large land owners or by the farmer as found near big towns. The majority of Indian farmers

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live far from town, railways and even roads, and their holdings are very small. Again the majority of the farmers are illiterate and an illiterate farmer is from necessity and possibly from experience a very conservative person.

Now the effect of illiteracy, conservatism, distance from markets and smallness of holdings is very great when we come to consider improvements in conditions and methods. Illiteracy puts out of question propaganda through press or print.

Conservatism based on the experience of hundreds of years of Agriculture in India should be respected.

Distance from market towns tends to lower production, for increased produce entails increased labour and that, without increased cash returns, is unattractive.

With smallness of holdings is bound up lack of capital which puts out of question investment in expensive articles of agriculture.

Expense must not be judged by European standards; to many an Indian farmer an expendture of Rs.15 is a serious consideration.

From the above remarks it must not be concluded that the Indian farmer is either ignorant or unwilling to improve. Experience shows that he is ready to benefit himself whenever opportunity offers but zeal for "improvement" is often inclined to lose sight of the experience of the zamindar, and to class wise caution as crass stupidity. To an Indian farmer his wheat crop means bread, means life both for his family and his cattle. If his crop should fail he is not in a position to go to a baker for bread or to a corn chandler for his cattle feed. His family and cattle must starve and the loss of the latter is probably the greater calamity. Under such circumstances can we blame him for not always jumping at the opportunity to use a new wheat or adapt a new method of cultivation? He would be a fool to do so until the change was conclusively proved to be a benefit to stomach and purse.

(*b*) This matter of demonstration and proof is then the bed-rock of all progress in Indian agriculture. If a change is worth making in plant or cultivation, the benefit to be obtained must be demonstrated.

In regard to this demonstration there are several points which must be considered. Owing to the poverty of the bulk of the people and poor communication, demonstration stations must be handy and at places where the people have to go in the ordinary course of business; this in most cases, will probably be the tahsil headquarters. To have a demonstration station at every tahsil would be impossible but a start could be made and the station after some years could move on to another tahsil. Such stations should be looked upon as missionary, they should expect no reward, i.e., profit, nor should they give any reward. One of the plagues of India is extraneous and unearned income; the only way to avoid this evil at present, is to give a man no power of good or evil, no power to reward and no power to punish. At these stations staple crops should be cultivated according to improved methods, but no experimental work should be allowed; experimental work with its inevitable failures is not understood by the zamindar; such work must be reserved for centres such as Lyallpur and the less the zamindar knows about it the better.

In all work at the demonstration centres there must be a close understanding of local conditions. It is no good demonstrating a Rs.5,000 thresher, however great the benefit until the zamindars have learnt to co-operate among themselves. It is no good demonstrating an iron plough if the spare parts have to be order from America.

A half square of land 12½ acres, should be sufficient to grow all the crops that are required and to allow of a good rotation. The stations would not be self-supporting but the sale of the produce should go far towards meeting overhead charges.

The supply of good seed is of enormous benefit to the zamindar and every effort should be made to encourage him to use it. The demonstration stations should be able to supplement available supplies and when full supplies are available *tehsils* and the revenue staff should be utilised both for distribution and propaganda work. No attempt should be made to stimulate a demand until supplies are available.

(*c*) To supplement the demonstration stations, I advocate that a small area (1 acre) of a man's land should be taken over. Find out his average outturn, promise him all profits and accept responsibility for losses on that average. The owner to prepare land and manure under instructions; give him seed, and make him tend and water his crop according to instructions. Have strict supervision over his plot. Start, in quite a small way, two such a plot in a *tehsil;* gradually extend number of plots, as the supervisor gains experience. Very careful selection of supervisors and inspectors of plots is essential. When the scheme has advanced and there are enough people in neighbourhood interested, have competitions for best acres plots of wheat, cotton, and other crops, as they do in Australia. It must be realised that some cultivators are very expert men and, like all farmers, very conservative, and will only change their methods when they are certain that new methods will bring them in more money; therefore the demonstrator must be efficient and loyal to his profession to show conclusively that better methods will produce more money. In India, as in other countries, profit is the only incentive to progress.

QUESTION 4.— ADMINISTRATION.—(*b*) I consider that each Province requires very highly qualified Economic Botanists with efficient staff suitably paid.

Plants suitable for one locality are totally unsuitable for others; therefore the study of plants should be done in the Province. Cottons, and wheats suitable for Okara may be quite unsuitable for Khanewal but field experiments can be quite well carried out on selected estates, under botanical supervision of provincial experts, but these experts must be the best obtainable.

(*c*) I have always received all the assistance available from the Agricultural Department but their staff is quite inadequate to meet the requirements of agriculture if advance is desired. The Lyallpur staff is almost entirely occupied in educational duties. The local officer in Montgomery cannot possibly get to know local conditions and the people; his area is much too large. In order to help them an intimate knowledge of the people is necessary. The agricultural officer must get to now cultivators personally before he can help them and, on the other hand, until the cultivator knows the agricultural officer he will neither seek his assistance nor readily accept his advice. The agricultural officer must gain their confidence first. With the present paucity of staff, cultivators hardly know of the existence of an Agricultural Department. The district agricultural staff should be augmented by efficient officers and staff.

QUESTION 8.—IRRIGATION.—My difficulties with the Irrigation Department come under three main heads—

(1) Drainage,

(2) No service—
  (*a*) No attention paid to complaints.
  (*b*) No attempt to rectify damage.
  (*c*) Irregular distribution of water.

(3) Irregular charges and alteration of charges without warning.

These points were brought to the notice of the Superintending Engineer by the Okara Zamindar Co-operative Society and a memorial sent to His Excellency the Governor.

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1. DRAINAGE.

Subsoil.—The water level in my wells rises 1½ to 2 feet a year; unless something is done, the land will lose its value rapidly.

Surface.—There is no surface drainage to carry off surplus water, rain or spill. Year after year I prepare lands in *rabi* hoping to obtain a *kharif* crop, but after any rain, water collects and spoils all our labours. At times as much as 3 feet of water stands on the fields. I lose some 300 acres in the *kharif* through this water-logging.

The zamindar is often accused by the Irrigation Department of wasting water and often he does waste it, but the greatest waste of water is by the Irrigation Department itself. The distributaries are constructed to carry the maximum full supply and no more. There is no drainage and no escape outlet to take up water not required. If heavy rain falls on my estate, it may not fall twenty miles lower down where water is urgently required. I cannot shut my outlets and let the water down the distributary because it will breach the bank lower down, the channel not having been constructed to carry an excess supply which is not required by me. I am forced then to take water that floods my land and causes great damage.

(*b*) Canal water is the life of agriculture in these parts; without it we are hopeless. Probably no Department in India has done more for the prosperity of the country than the Irrigation Department but its administrative methods are far from perfect. If the Government of India desire to improve agricultural conditions in these parts, the first thing to do is to have an impartial enquiry into the administration of the Irrigation Department. Rates are a question of revenue; if Government does not wish that question opened, leave it out, but an enquiry into administration is imperative. At present the Irrigation Department is purely a revenue-earning department and pays little or no attention to agricultural requirements. There is no redress against the Irrigation Department if complaints are not attended to, and if the Deputy Commissioner is approached he replies that he is sorry the matter is not in his province. If the matter is referred to the Financial Commissioner, he can obtain no reply from the Chief Engineer. I am in a position to put up a case in a comprehensive manner. If such is then ignored, what happens to the ordinary Indian cultivators? Even without rain, if for any reason I have enough water and do not require my full supply for 24 or 36 hours, I cannot reduce my outlets. The capacity of the distributary should be slightly increased and drainage and escapes into drainage should be provided. By giving 24 hours' notice to my Subdivisional Officer I ought to be able to close or open my outlets.

When I was taking water by volume, it was a condition in the contract that I could not close my outlets without giving one week's notice to Subdivisional Officer, but people at Montgomery or Khanewal might have required water badly.

The Irrigation Department at one time accuse the cultivator of wasting water and at others of having too much land under cultivation. They give water for one-third area per crop which is fair enough if we get it. But the only man who can possibly say when his crops want water is the cultivator. This depends on soils, seasons and weather; alkali soils take more. If his crop does not want it, he cannot turn it off and has no alternative but to flood his crop or to turn it on to a catch crop; in the latter case he is charged extra, though no more water has come to him. By manuring and good cultivation a zamindar can make his quota of water go further, *i.e.*, he can cultivate more crops. But this would be used by the Irrigation Department as an argument that the quota of water could be reduced. This is a distinct discount on careful cultivation.

It must be realised that some land is one-crop land, *i.e.*, will not bear cotton. On the other hand, I consider that it does great harm to crops and

land to put water on when none is required, and the cultivator is the only person to know when his crop is wilting, but he has no control over supplies.

2. No Service.

(*a*) No attention is paid to complaints. Letters remain unanswered and no action is taken regarding them.

(*b*) No attempt to rectify damage. When breaches occur, as they have done continually on my estate, it was only by claiming heavy damages that I obtained any relief.

(*c*) Irregular distribution of water. Last *rabi* I was given 17½ days' water on one distributary out of 89 days. Only the other day, according to programme, I should have received a half supply commencing on 5th December; water was released from the Balloki weir on the 6th and instead of receiving a half supply for four days, I received only 13 hours' water.

I have expressed my own difficulties; let me now put forward the difficulties of the small cultivators.

In this matter as far as possible I put forward the views of the small cultivator, the man who has no knowledge of cusecs, of deltas, and who cares little for return on capital expenditure, the view in fact of the ignorant man whose one idea is to get as much water as possible and who has still to be trained in the economic use of water.

It is necessary at first to examine the system of distribution of water in vogue on the Lower Bari Doab Canal.

A certain capital sum having been expended in the construction of the canal, it is the present duty of the Irrigation Department to see that as large a return as possible is obtained for the expenditure. With a fixed supply of water, there are two ways of doing this, to make the available supplies go as far as possible, in other words, the less water used per acre the more acres under crop; and to pitch the rates for crops as high as possible. With the rates we are not concerned but it is open to question whether the position of the zamindar is altogether happy in having to apply in regard to incidence of charges to a department whose efficiency is probably judged by the financial results of its expenditure, rather than to a department which could examine his case without consideration of return on capital expenditure.

With the actual quantity of water distributed, there is no fault to be found. It is well known that alkali lands call for a larger quantity of water than ordinary clean soils and it is also well known that certain lands require watering before any work can be done on them, while there are lands which can be dry-ploughed. These three types all get the same quantity of water. The charges will be the same, while the alkali land will have produced a poor crop and the average land will have cost more to cultivate than the dry plough land.

As regards the actual distribution, the system is as follows:—

The supply to the canal is regulated at the Head works and with this the zamindar has no concern. The duty of the cusec having been determined, minors and distributaries take off the water at suitable points, and receive that amount of water which is the quota for the culturable area commanded. The water in these channels is controlled by gates which are raised and lowered by low-paid employees of the Irrigation Department. From these channels lead off the village channels, and from the latter the tenant's channels. The former are supplied with the calculated quota of water sufficient for the culturable area of the *chak* or part of the *chak* commanded. The supply in most cases is through an open outlet designed to carry the supply due but not protected in any way. The division of the water from the *chak* channels is arranged by the villagers and therefore need not be discussed further.

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3. Charges.

We must go one step further back and mention the system of charges for water, for although these are not within the terms of the reference to the Royal Commission, the system of assessment is one of the causes of dissatisfaction among agriculturists.

These charges are based on the crop grown; the more valuable the crop in the market the higher the charge for the water; this system necessitates periodic surveys of the crops grown and these are made in the first instance by a *patwari*, a notoriously low-paid official.

Now the main objection that is raised to the present system of distribution of water is the opportunity that it gives for oppression and the temptation that it engenders for bribery and corruption. The zamindar can and does approach the *patwari* to make his survey as lenient as possible. If the zamindar does not make this approach it is not unknown for the *patwari* to make the result of his survey more burdensome than it might have been.

The outlets are in many ways capable of alteration. They are so altered by the zamindar; effective threats to make alterations can be made by the Irrigation Department.

The gauge readers also can interfere with their sluices.

It may be said that such matters must come to light. They may, but by the time they do, the gain in water has been enjoyed, or the loss has been suffered and neither can be altered.

The average zamindar is absolutely in the hands of the *patwari*, the lowest paid official on the revenue staff. It is the *patwari* who reports on the crops; it is the *patwari* who can report on excess water and also on shortage and he is the man to whom ultimately come all complaints or petitions for report.

To stop the very serious discontent which such matters cause, and it might be appreciated that hardly any of these complaints are voiced, for it is well known that the lengthy enquiry which will ensue will probably end in nothing more than to make an enemy of a very powerful official, I would make the following suggestions:—

That the fixing and collection of water rates should be divorced from the Irrigation Department. The Irrigation Department should be solely concerned with the engineering side of the problem of supply.

The duty of the water and charges to be made for it should be fixed, as in the case with the land revenue, for long periods. There should be no power to alter these items in the hands of departmental officers.

The duty of water having been dcided, a fixed tpye of enclosed outlet should be employed so protected that it would be incapable of alteration.

What should be aimed at is to arrive at a system which allows of the minimum of peculation, and this is best attained in this country by a system which calls for minimum of supervision.

If you look for economy in the use of water, have a volumetric system of supply. When I was taking the volumetric system, Irrigation Department officers of all grades said to me, "Why do you take the volumetric system, you are losing money over it?"

If the officers express such ideas, as they have done to me constantly, the popular idea would naturally be against the volumetric system. My view is that the volumetric system of supply is the only fair system. Then a given quantity is allowed, say one cusec for 88 acres, the cultivator can do what he likes with it and use it for whatever crops he wishes to grow, he can cultivate 70 acres and 100 acres. If he works his land well and feeds it he gets the benefit. On the contrary, with the acreage system, exactly the same amount of water is given, one cusec for 88 acres, but if the cultivator by working hard and using his brain and muscles, cultivates 100 acres he is charged for the extra 12 acres although not a drop more water is given.

All *kharaba* should be abolished if you want better methods of cultivation; it benefits the bad cultivator. The bad cultivator ploughs his land once or twice, throws in the seed, and hopes for something to happen; if nothing happens he has wasted water and claims *kharaba*.

In September, 1917, there was a Punjab Government Committee held in Simla to consider the advisability of trying a volumetric system of supply. It was opposed by Mr. Ward, Chief Engineer, but was advocated by Sir John Maynard and Sir Patrick Fagan, and it was agreed that the system should be tried. It was laid down that the price of water by volume should be worked out so as not to exceed the value of water by the acreage rate. Later, I and some other landholders were asked if we would try a volumetric supply. I accepted as from 1st April, 1919. The rate was gradually raised from 20 per cent. to 60 per cent. over the acreage rate to choke us off. (See Irrigation Branch Paper A—27 of 1923, page 2, paragraphs 4, 5, 6.)

On the 30th September, 1924, I was forced to go back to acreage rates. In March, 1925, there was a meeting in Lahore, in the Financial Commissioner's Office, presided over by the Revenue Minister, Sirdar Sundar Singh Majithia, and attended by Mr. King, Financial Commissioner, Mr. McLeod, Irrigation Department representative, and several landowners who had taken the volumetric rate. We represented that the rate was too high and quoted Sir J. Maynard and Sir P. Fagan and the figures which were put before them. Mr. McLeod promptly said these figures meant something quite different, or words to that effect; we called for his figures and the meeting ended on the understanding that the Irrigation Department figures should be given to us. From that day to this I have not seen any figures. My contention is that the Irrigation Department is mainly concerned with collecting revenue and does not give the cultivator anything approaching the service to which he is entitled and pays for. If the individual questions the methods of the Irrigation Department, the door is locked, bolted, and the blinds drawn.

The Irrigation Department are Engineers; let them remain Engineers and give us the service we require. The collection of revenue should be in the hands of the Revenue Department; then we should probably get gauges which read with some degree of accuracy, and the volumetric system of supply.

Mr. Sangster, the Chief Engineer, when examined by the Commission in Simla, is reported to have said he was in favour of a volumetric system. If that was the case, why did he choke off people who at the request of the Government were experimenting with the volumetric system, by putting on very excessive charges?

To show the views of some Irrigation Department Officers, though fortunately not all, let me quote from Punjab Irrigation by W. P. Thomson, page 114, paragraph 1.

"*Paragraph* 1.—There has not been from the cultivators any universal attempt at association with the department even to the extent of understanding what volume was due to them at the outlet.

"*Paragraph* 2.—If the cultivators educated themselves to the extent of understanding that, *i.e.* (what was due to them) they would perhaps ask for a metered supply.

"*Paragraph* 5.—It is stated that these contracts have been entered into by the parties in the hopes of preferential treatment as regards their water allowance.

"*Paragraph* 6.—This spirit is quite the reverse of that required for the success of volumetric assessment.

"*Paragraph* 7.—In fact the amount paid by the contracting parties under the volumetric assessment has been more than they would have paid under an assessment by acreage.

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"*Paragraph* 8.—This is in spite of the fact that the rate per day cusec, viz., Rs.2-8-0 in the *kharif* and Rs.5 in the *rabi*, is a lesser rate than has been calculated from the statistics available, and there has not been any economy in the use of water."

My experience is exactly the reverse in regard to 2, 5, 6, 8.

My difficulty is to obtain from the Irrigation Department a gauge which will approximately measure water. If there was such a gauge, cultivators would very soon understand it.

The best gauge I have come across is the Crump type.

In Punjab Irrigation Branch Papers class A-27 of 1923, page 3, paragraph 8, speaking of the Lower Jhelum Canal, the writer says, "On this canal remissions are negligible and water rates somewhat less than on the Lower Bari Doab Canal.

"Allowing for measurements of supply of outlets it will be seen that on this canal there is no margin of safety. Canal water rates are admittedly too low, so that a comparison with what the purchaser would have to pay for his water at these rates is no proof of his inability to pay more."

The Government of India is not a *shroff;* it wishes to arrive at an equitable rate for all.

Again, on page 5, paragraph 8:—

"However, no matter what system of volumetric system is devised there seems very little chance of its becoming popular so long as our water rates continue at their present low level, whatever may be said as to the advantages of getting rid of Canal interference, &c., &c. A few big landowners may nibble at the idea and accept volumetric assessment largely in the hopes of preferential treatment as regards their water allowance, but our present system of assessment by acreage being so favourable to cultivators there seems no hope of its general adoption."

This Officer seems very satisfied with everything from an Irrigation Department point and does not mention the perquisites demanded by the Irrigation Department officials. In this part of my reply rates have been discussed, but as my object is to show that some people in the Irrigation Department are quite satisfied with methods as they stand and have no desire for any change, I had to bring this in.

QUESTION 9.—SOILS.—(*a*) (i).—*Drainage.*—This is the first essential for land reclamation and, judging from what I suffer on this estate, thousands of acres of cultivation are lost every *kharif* from want of any sort of surface drainage.

Wind screens.—I am a great believer in sheltering the land from hot winds. As fast as I can, I grow trees on my roads and water courses. My experience here is that when the crop is protected by trees from hot drying winds the crop is heavier, greater root residue is left in the land, and year by year the moisture-holding power of the land is increased. The lands on which I have my stud paddocks were mostly waste *kallar* for which I could get no tenants. Each square is now bounded on all sides by trees, and with deep ploughing, good cultivation and protection from hot winds these squares are now some of the most valuable lands I have. I consider that every road along the rectangles should be bounded by trees. The popular idea is that trees injure crops. The *kiker* may to some extent, but not so much as estimated; in any case, here, trees do more good than harm by protecting the crop and gradually increasing the humus. I have lands here which were covered by jungle and full of humus, the jungle was removed, the wind screens have not grown up, and there is no sign of humus, the hot sun having burnt everything out of the land which is now very hard to cultivate. I have land here which was marked on the original map as *ghair mumkin*, i.e., impossible land; through protection from winds, deep and good cultivation these lands are now highly productive.

(ii) My most successful experiments here with alkali soil, soil on which not a blade would grow, were done in the following manner:—

Deep ploughing and flooding, followed by about 15 tons of farmyard manure to acre. Then *dhub* grass (*cynodon dactylis*) was trampled in. The grass took quickly and has given a good feed now for two years, and when it is turned in I will get a fine oat crop. If you watch a water-course through the worst *kallar* land you will soon find *dhub* grass along the edges; this gave me the idea.

My experience is that such lands will not take *shaftal* or *senji*, at first, even if *dhub* grass is growing well, but will after a time.

It must be realised that all land reclamation takes time and money; it is not a cheap entertainment; generally, land after reclamation, is very valuable.

The cheapest way to reclaim alkali land is to fold sheep, cattle, camels, horses on it, an acre at a time.

QUESTION 10.—FERTILISERS.—(*a*) These alluvial soils are crying for organic manure, but there is not nearly enough available. My impression is that until you have land full of humus, artificial manures have nothing to get hold of and are rapidly washed out of the soil before they have any effect on the crop. I may be wrong.

There is an immense bulk of cotton stalks produced every year and burnt or wasted; I consider that every effort should be made to return these to the land in the form of manure. Here I have pits into which stalks are pressed with earth and manure to start fermentation; in some pits I have put lime, in others, gypsum. The ideal is to get the cattle standing close to the pit, and place dung and earth regularly on the pit with water, to set up fermentation. In my first attempt the stalks took 1½ years to decompose, now I hope to get them fit for the land in a year, but our chemists should be able to help us to get manure in six months. These stalks are too valuable to waste. The danger to guard against are eggs and larvæ of boll weevil. It is necessary to prevent white ants eating up too much of the stalks as the residue then becomes too fine instead of humus.

A rapid and inexpensive method of turning cotton or *arhar* stalks into manure is urgently required as the available cattle manure goes a very small way.

In my very limited experiments here with artificials, phosphates seem to benefit lucerne and have kept some alsike alive through the hot weather.

(*c*) Before you attempt to popularise any fertiliser the value of such as a fertiliser must be absolutely proved on Government farms or large estates, and then shown on demonstration plots; the ordinary zamindar has no money to spare for experiments.

(*f*) Grow timber either road side or belts; this was advocated by Voelcker years ago. If people have no wood they must burn cowdung: a small amount of cowdung will generally be burnt as it makes a slow burning fire for boiling milk, but one wishes to stop the general use of it.

QUESTION 14.—IMPLEMENTS.—It must be realised that you are dealing with people many of whom have been zamindars for generations and are not fools, but expert in their own way; they are very conservative but are quite ready to take a new implement when they are certain of its value, provided they can get it repaired easily in the immediate locality and can get spare parts. It is not reasonable to thrust an iron implement which may break in a week on a man who has no possible means of getting it repaired or spare parts for it. In my opinion the only possible way of popularising simple modern implements is to work through co-operative societies, who would arrange to train village blacksmiths to do essential repairs at once and the village society agree to keep spare parts.

Unless you have your blacksmiths and shops handy, modern implements in rural districts are difficult to maintain. Here I have my repair shops

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to mend ploughs and harrows, and the people seeing the seed drills working on the stud farm realise the use of them and are beginning to ask for them.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) In my opinion breeds of live-stock in India will improve only as the public demand increases. England is said to be the Stud Farm of the world. Why? Because, firstly, the home demand for animals of better quality induced breeders of stock to improve their flocks, and thus attracted the foreign market and increased the demand, and the breeders met the demand for all classes of stock.

Sheep.—We can improve the breed of sheep immensely and get better wool, but there is no demand for the carcass. One can sell a few odd sheep, but there is no market to take 100 or 1,000 wethers. If we had a cold storage to take the carcasses we could raise feed for sheep and greatly improve our lands.

Cattle.—We have noted breeds of cattle in the Punjab, some famous for milk, but until the public demand for good cattle increases no advance in cattle breeding will take place. Also the public, if they require good cattle, should assist. For example:—I am a cattle breeder; I breed ten good milking cows. I require two for my herd and sell eight into towns. Those eight cows are then sent to any sort of bull, and those eight good milking cattle are lost as far as reproduction of good milking cattle is concerned. If townspeople in India require good milk cattle they should form societies to keep bulls of good milking strain for their cows. The difficulty is that owing to religious susceptibilities too many cattle are kept for the food available. In the Amritsar district they now have a horse breeding society, keeping their own stallions. The same could be done with bulls of milking strain.

Horses.—India can, and does, produce excellent horses, but the breeders are not sufficiently encouraged by racing, which ought to be the natural support and ally of horse breeding. Most of the encouragement, in the shape of attractive and valuable stakes, is given to imported horses, which are of little or no value to Indian horse breeding, a very large percentage of them being geldings. With proper encouragement from the Turf Clubs the home industry of horse breeding could make India self-supporting in horses for all purposes and retain in the country the money now exported annually for horses from overseas.

Racing should assist in creating and expanding the market for home-bred stock and encourage the breeders to produce their own line of sires and standard in an Indian breed. Without encouragement from its natural ally, racing, horse breeding can make little progress and must remain more or less an artificial industry bolstered up by unnatural subsidies.

(*b*) Good fodder is the basic need of Indian farming.

In quantity dry fodder is generally available, but the quality is lamentably deficient, the albuminoid ratio being very low.

In these parts *guar* seems to give the greatest bulk of leguminous fodder, but when dry is not fit for feed. It would make good silage, as also would *val*. I think propaganda advocating the use of leguminous silage is the most hopeful way of improving the dry fodder question. This can only be done through co-operative societies who keep up small chaff cutters and bullock gear, mounted on sleighs or low wheels for transport. Chaff cutters should be mounted on bent steel rails and not cast iron, which break easily. By utilising more manure the area of paying crops can be reduced, and those for fodder slightly increased.

(iv) On irrigated areas one should not have to talk about dry seasons, but we have seasons of great shortage of water.

In the Punjab we have a variety of good green fodders, but the trouble is, excepting lucerne, I know of none which are perennial. The constant cultivation required adds greatly to cost, and the quantity is very deficient.

Senji requires little cultivation, but gives one cut only and is not a very good feed. *Shaftal* should give three cuts; it is a good feed but does not seed, and the fresh seed has to be procured yearly from the North-West Frontier Province. Indigenous grasses do not do well in *rabi*.

One year I tried *phalaris bulbosa* seed from Australia, which gave quite a good crop of grass in February, March, and came up a second year; however, I have not been successful with it since; possibly the seed was in fault. I am trying it again this year.

Kharif.—Here we have several good fodders of good value, *munj*, *moth*, *guar*, but not perennial. Green *guar* gives a heavy yield and with lucerne is a very good feed.

Lucerne is the best of all fodders, but I have not been able to keep my stand of lucerne for more than two years. The need of a lucerne which will stand three or four years, through a rotation, is very great, as this has a very improving effect on the land. One of my finest stands of cotton this year is after lucerne. If someone can produce a lucerne, wild white clover, alsike, subterranean clover, or some such-like perennial plant to last three or four years it would be a great thing, and I do not think it is impossible. Wild white clover is indigenous in Kashmir, and some of the Australian varieties of clover might suit. This question requires to be taken up by expert botanists. Without good fodder, dry and green, our cattle cannot cultivate our lands effectively, nor can we obtain sufficient milk for the population, or feed for our horses.

(*c*) The green fodder shortage here is from 15th October to 15th January, by which time *shaftal* is available. Last year's lucerne should be ready by the 15th December and lucerne sown in October should be ready for first cut by 15th January.

(*e*) This depends largely on the efficiency and personality of the agricultural officer. If he can make friends with large landowners likely to assist him and can assist them, then, when they see the benefit, or profit in sight probably they will be only too ready to take a practical interest. This is what happens in England and it can happen just the same way in India, but the agricultural officer must be the right type of man and know his business.

QUESTION 20.—MARKETING.—Some years ago the Agricultural Department helped the zamindar very greatly by holding periodical auctions at centres for high grade Punjab American cottons, such as 4-F and 289, and thereby attracted buyers to a high grade cotton; previous to this we were unable to obtain much, if any, premium for our good cotton.

After two years of these auctions by the Agricultural Department, the buyers became acquainted with the growers and growing areas and there was no further need of Government introduction as trade connection was established; but I certainly consider that very great benefit accrued to the grower by being thus brought into direct touch with buyers, and I consider that we should never have got the prices we did if it had not been for this timely assistance.

Now some of us are producing a high grade wheat (Punjab II and 8-A), clean with no barley mixture, yet it is barely recognised by the market. I consider that if the Agricultural Department held wheat auctions at large centres as they did with cotton, we might attract potential buyers. I consider that if elevators were introduced at large centres where wheat was graded, it would assist and save greatly in sacking and handling charges, but unless there were elevators at Karachi, elevators elsewhere are useless, such as the one in Lyallpur; also the railway would have to take wheat in bulk which I understand they are prepared to do.

QUESTION 22.—CO-OPERATION.—(*a*) I believe that if it is desired to improve agricultural conditions generally in India the most hopeful method is

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through co-operative societies, where possible by non-official agencies, otherwise with Government assistance; but the Government control of the co-operative societies should be lessened as soon as the society is able to control its own affairs. In rural districts it is the agricultural requirements of a selling and buying agency and many other agricultural requirements such as banks, which first attract the attention of people to co-operation.

The agricultural development movement and rural co-operative society movement must work together; this does not mean that the Agricultural Department does not help co-operative societies, as they do very much, but the touch should be much closer, and this will do more than anything else to encourage the growth of co-operative societies.

(*b*) (iii) We have a society here, the Okara *Zamindar* Co-operative Society, for sale of produce and purchase of stores. This has been in existence since 1917; we started in a small way, but now have a large turnover.

The Registrar of the Co-operative Societies is always ready to assist when we require assistance, which is not often, but the great thing is that the Inspector periodically inspects accounts, and we have the benefit of certified auditors to check our accounts. Judging from our society here, the mutual goodwill and better understanding of business methods and good fellowship amongst members is a very great asset. I consider that there should be much closer ties between the Agricultural Department and these societies; the societies can and will help the Agricultural Department in many ways where the work of the Agricultural Department could not otherwise penetrate, such as training of village blacksmiths, distribution of modern farm implements, seed, demonstration plots and many other ways.

Local markets for cattle and sheep should be encouraged; properly organised sale yards at large central markets and fairs should be encouraged, where auctions can be held.

Oral Evidence.

43,818. *The Chairman*: Col. Cole, you are engaged in horse-breeding and in farming in the Punjab?—Yes.

43,819. Would you give the Commission quite shortly an account of the extent of the land that you farm and any particulars that you think may be of value?—I have got 7,500 acres of which about 1,000 acres are kept for the stud farm and the rest is all on the *batai* system. The stud farm portion I farm myself; I have got six tractors and I also use cattle.

43,820. These 7,500 acres are commended by canal irrigation, are they?—Yes.

43,821. You have given us a note of the evidence which you wish to put before the Commission. Do you wish to make any statement at this stage in addition to what is stated there?—No.

43,822. Under the heading, "Research," in answer to our Question 1, you indicate one or two directions in which you think research should be taken up. Have you had an opportunity of studying the five year programme for the expansion of the Agricultural Department which is now under consideration?—No, I have never seen it.

43,823. You will be glad I think to hear that there is a proposal to appoint a whole-time Leguminist.

I should like to ask you just one or two points. Will you turn to page 486 of your note. You point out, in answer to our Question 3 (*c*), that quite apart from the demonstration farms which of course are conducted entirely by the Department's officers, it would be valuable if an arrangement were made with individual cultivators whereby a part of the cultivator's land would be given over to cropping on approved methods with, presumably, approved varieties, so that cultivators around him might really see what

can be done under the conditions of the holding of the ordinary cultivator; and then you wisely point out that strict supervision will be necessary. Do you not think that any extensive adoption of your suggestion would place a very heavy strain on the staff of the Department?—Yes, it would; first of all, you have got to have your trained personnel, and unless you have got your demonstrators anything in that direction will be dangerous; you have got to go very, very slowly.

43,824. On page 486 and succeeding pages in answer to our Question 8 on Irrigation, you set out your views very plainly in the matter of the Irrigation Department and some of its shortcomings. Officers representing that Department were before the Commission this morning, and I and my colleagues read to them extracts from your note. We should be glad to clear up one or two points in due course. Is it really the case that letters of complaint addressed by you to the proper quarters are not even acknowledged?—Yes, that is true.

43,825. At one time you undertook to take water on the volumetric basis and you could not continue because the scale of charges was raised?—It was gradually raised. At a meeting which I attended in the year 1917 it was distinctly laid down that the charge should not be over the acreage rate. I have got figures here to show that the rates were gradually raised by 60 per cent.

43,826. I do not quite understand your argument on page 487 in the paragraph beginning with: "They give water for one-third area per crop, which is fair enough if we get it"?—That is the ordinary crop rate, one-third.

43,827. Did you ever have a chance of interviewing these officers of the Irrigation Department who would not answer your letters?—I go down to Montgomery and interview them there. The orders of the Government were that they should have periodical meetings, but nothing of the sort was done at all here until about one and a-half years ago.

43,828. To whom do you write?—To my Executive Engineer.

43,829. With how many owners or cultivators has he to deal with?—They are a large number.

43,830. So that you do not expect him to send an answer by return of post?—No. Personally I do not think there is any malice. The fact is that these offices are not properly organised.

43,831. On page 492 you give very interesting particulars of your experiment in recovering alkaline soil. You must have had a varied menagerie on your farm! I see you had sheep, cattle, camels, horses, and so on. Could you tell us something about the economics of this experiment. Did it pay you pretty well soon after you did this?—It paid in the second year. This is only on a small area; I have done it on land which would not grow a blade, and it is not a thing that you can do on 12,000 acres all at once. My idea is to extend it gradually.

43,832. On what terms did you obtain the land that you reclaimed? Did you get a certain remission?—No remission at all. It was handed over to me in block, good, bad and indifferent, all together.

43,833. Is that land that had deteriorated in your time?—No; when I took over it was alkaline land, growing nothing.

43,834. You point out on the same page the desirability of converting the cotton stalks into manure?—This is the only bulk of waste material left in the country; everything else is exported and I am trying my best to get it back to the land somehow or other.

43,835. I wonder if you have heard of the experiments being carried out at Cawnpore by Dr. Fowler; those experiments seem to be very promising?

—No; I do not know about them. Dr. Lander, in Lyallpur, is assisting me in this matter.

43,836. Have you actually come down to the six months' period preparation, or is that your hope?—It will certainly go down to a year.

43,837. On page 494 you say "the Agricultural Officer must be the right type of man and know his business." What do you say about the class of Agricultural Officer at present employed?—I think they want a great deal more training and experience.

43,838. The difficulty is to replace the training and experience which comes from actual management and work on a farm?—Yes.

43,839. And that is just the sort of experience that you like a man to have, practical experience on a farm?—Yes.

43,840. On the same page under the heading Marketing, in answer to our Question 20, you say: "Some years ago the Agricultural Department helped the zamindar very greatly by holding periodical auctions at centres for high-grade Punjab American cottons such as 4-F and 289 and thereby attracted buyers to a high-grade cotton." Have those auctions been discontinued?—There is no necessity for them now. We have got touch with the market. Buyers come along.

43,841. That was really by way of advertising the better quality?—Yes, to bring the buyers in touch with the growers; it was a very useful experiment.

43,842. You think that that experiment might be repeated in order to advertise the Punjab 2 and 8-A?—Yes; I think it would help a great deal. I saw somebody giving you a reply down in Delhi that there is no pure wheat grown in the Punjab. We can provide him with any amount of pure wheat in bulk. I dare say Mr. Roberts also can do so. Some time ago the Karachi people said that the trade was a parcel trade (meaning mixed wheat of different quantities); the parcel trade was made by Karachi, not by us.

43,843. You have put forward various points in connection with your answer to our question on Irrigation, to which I referred sometime ago. There is one point to which I wish to refer in particular, the absence of service. Does it include these matters only, viz., "No attention paid to complaints," "No attempt to rectify damage," and "Irregular distribution of water," or are you thinking of a somewhat wider circle?—A much wider circle. Some time ago I wanted a surveyor to help me in the matter of some of my water courses. That is a legitimate thing to ask the Irrigation Department, and I was quite prepared to pay for him. I wrote for him and I got a reply that he would be coming, but the man never came to me.

43,844. To work out the levels?—Yes; I thought it could be better handled by working out a new level.

43,845. Can you tell us how long ago you made that demand?—Speaking from memory, about a year last October.

43,846. You say that letter was acknowledged, but no surveyor ever appeared?—That is so. The only time I was helped was the other day, when they helped me to put up a new fall. I provided the material and they gave me a man and designs for it.

43,847. Is this sending of a surveyor in order to advise irrigators in the matter of laying out new channels recognised as part of the work of the department?—I think it is quite a legitimate call. I am prepared to pay for the services of a man, but I cannot myself obtain an expert and they have plenty of them.

43,848. *Sir James MacKenna*: I take it that so far as horse-breeding is concerned you are strongly of opinion that the ultimate test and the

greatest stimulus is the race-track?—Undoubtedly. The position here is the same as at Home and in other countries.

43,849. You are in very close touch with the Agricultural Department, and you know there is a proposal to expand it. What do you think are the most important lines it should develop in addition to the services it at present provides?—You must have plenty of thoroughly-trained and trustworthy demonstrators, and I think it is necessary to have an Economic Botanist.

43,850. You favour rather an expansion of the department on lines already adopted, and you think an increase desirable in the number of trained men, both on the senior and junior staff?—Only a short time ago the Inchcape Committee made considerable retrenchments and now all the talk is of expansion. Before you can go in for expansion, however, you want a supply of thoroughly-trained men.

43,851. That means that the Lyallpur College has got to go ahead and produce men as fast as possible?—Undoubtedly.

43,852. Have you tried any of the Pusa wheats on your farm?—Yes, and also Cawnpore 54 and 56, but I had to give them up because they suffer more from rust than the Punjab wheats.

43,853. Your Punjab wheats suit your requirements better than any others you have tried?—Yes.

43,854. *Professor Gangulee*: You say you want an Economic Botanist. Do you mean you find there is need for more research work in that direction?—Certainly.

43,855. You would have more research and more demonstration?—Yes.

43,856. What is your experience of propaganda work carried on by co-operative agencies?—I have none. I am a great believer in the Co-operative Department and in the propaganda which co-operative societies could carry out.

43,857. But you have not come in contact with them at all?—Not with their propaganda work.

43,858. From where do the cultivators in your neighbourhood get their seeds?—From me.

43,859. Not from the department?—No.

43,860. *Mr. Calvert*: On the last page of your note you suggest that official control of co-operative societies should be lessened. Is there any special point there you wish to bring out?—No. All I meant was that it is very often difficult to start your co-operation without some official assistance, but that directly they are able to stand on their own legs, as you know, it is better to leave them to work out their own salvation. I make a great point of supervision of accounts, of course.

43,861. You were not thinking of any alteration in the present practice?—No.

43,862. On the second page of your note you warn us against judging the agriculture of this province by the large landowners, and you put in a special plea for the small man?—Because he is on a different footing entirely.

43,863. What hope is there for the small man?—Take the case of estates like mine. I am quite ready to conduct experiments there. In fact, I have handed over a piece of land to the cotton expert for experiments, and I grow seed for him. Dr. Lander is working on some very interesting experiments on my land now. The results of these experiments can be passed on first to my own cultivators and then generally.

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43,864. You allow cultivators to come and see this work being carried on?—I am only too delighted if they do.

43,865. Do you have any applications from men to come to you for training?—No, and I have no training establishment at all.

43,866. *Mr. Roberts*: With regard to auctions, I take it your total production comes to 700 or 800 tons?—Yes.

43,867. Have you thought of the cost of carrying this to a marketing centre and looking after it?—It would go to Okara, where I am, and which is the largest centre between Lahore and Multan. I would sell it by sample, as you sell cotton. If anyone wants to see it in bulk he can do so in the godowns.

43,868. You would conduct these wheat sales chiefly by samples?—Yes, in the same way as the whole bulk of the cotton is not brought into a cotton auction, but is sold on sample.

43,869. It was brought in except in the case of very big estates?—The buyers knew where the godowns were, and they knew perfectly well what they were bidding for, because the godowns were open to inspection at any time.

43,870. I believe you run your estates on *batai*?—Yes.

43,871. You help your tenants in every way with regard to water-supply, seed and improved implements?—Yes, and loans.

43,872. We have had the view expressed that the *batai* system is a bad one. Do you think in your case it is working for the benefit of the tenants?—I think so. If you have the cash rent system the tenant will take as much as he can out of the land, and you will have difficulty in tying him down to a rotation. He would take as much as possible out of the land and then go off.

43,873. You can get improvements carried out more uniformly when you have the *batai* system?—Yes, and you can have yearly tenancy and a rotation.

43,874. *Sir Henry Lawrence*: Under the *batai* system, do you specify what crops shall be grown?—Yes. I have my rotation, and before they get the land they have to agree to my terms.

43,875. Is the land given out afresh every year?—There is a fresh agreement every year, but the tenants do not change. The rotation carries on whether there is a new or an old tenant.

43,876. *Mr. Roberts*: With regard to irrigation, you mention that the supplies are liable to be cut if you do too great an area?—Yes, if you have an area larger than the one-third allowed to be cultivated.

43,877. Your point is that it should not depend on what a man does, but on the quantity of water he gets?—My idea is to give a man a certain quantity of water and let him do what he likes with it.

43,878. This morning there was discussed a system of having an outlet of definite full capacity instead of basing it on area in any way. Do you think that would be a good thing?—That is the volumetric basis.

43,870. Not necessarily?—I do not understand the difference.

43,880. The charge would not be based on the amount of irrigation a man actually does?—A certain amount of water passes through the outlet and the man does what he likes with it. When you give a measured quantity of water through an outlet it is the volumetric system.

43,881. It does not matter so far as this point is concerned whether you pay on area or volumetric rates, so long as the outlet does not give you more than the authorised supply of water: that is the point.

43,882. *Sir Henry Lawrence*: Of your 7,500 acres, how many do you cultivate each year?—7,500; 100 per cent.

43,883. How many years did it take you to reach that percentage?—The land was taken over early in 1914, and by 1922 I had reached that percentage.

43,884. Are you working in close consultation with the Agricultural Department?—They give me every assistance.

43,885. Looking at it from the other point of view, what assistance do you give them?—From the very start I offered them land for experimental purposes, and I am quite ready to let them have pure seed. My offer has only just been taken advantage of, but now the Cotton Expert at Lyallpur and Dr. Lander are working on my land. They are trying to work out what the crop takes out of the land. It is a very interesting piece of work, but of course it will take a good many years.

43,886. Do you consider that your example has been of any assistance to your neighbouring zamindars?—I hope it has.

43,887. Do they come and see what you are doing?—Yes.

43,888. Do many of them come?—Not as many as I should like to see.

43,889. But you welcome them?—Yes, I am glad to see them. People of my own co-operative society come down there very often, but I do not know that the outsiders come very much; they buy my seed; they are very glad to get my good seed. I have got my own gins so that I produce my own seed cotton.

43,890. Do you pay any attention to the breeding of cattle?—No, I only breed my own plough cattle.

43,891. What breeds do you go in for?—Mostly Hissar.

43,892. Do you keep any premium bulls?—I do not know that they are premium, but they are bulls I buy from Hissar.

43,893. How many do you keep?—I have got about six.

43,894. Are they at service to other zamindars?—Yes, they are out in the villages; I am sorry to say they are not utilised as much as I should wish them to be utilised. There are bulls loose, but I do not see the appreciable improvement in my plough cattle that I should like to see. I often suspect that our people sell a good many of the good bull calves.

43,895. Do you regard cattle breeding as a source of profit to the individual zamindar?—No, I should not say it was; I encourage them to breed their own plough bullocks and keep their own good cows as much as possible. I have my own estate show and I give them prizes for the best cattle and calves; I pick them out and try to improve my own cattle as much as I possibly can.

43,896. Do you consider it costs you much money?—I do not consider the cost at all; I want to get better cattle; it is not a case of considering the cost.

43,897. But does it cost you a considerable sum?—Of course it costs me the prize money that I distribute.

43,898. I want to know whether it is a definitely losing business to any zamindar who tries to breed his own cattle?—No, I should say not.

43,899. *Sir Ganga Ram*: You have made a complaint against the *patwari* but I do not agree with the remedy that you suggest. You say that the fixing and collection of water rates should be divorced from the Irrigation Department. In whose hands would you put it?—I would put it in the hands of the Revenue Department; but since I wrote that I have heard that that has been tried, but not with beneficial results.

Col. E. H. Cole.

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43,900. You say somebody asked you: "Why do you want the volumetric system, you are losing money by it"?—Yes.

43,901. Did he tell you the reason for that?—No; they have always told me I should lose money on it from the very beginning.

43,902. Did you go into the details of it?—I have gone into the details very thoroughly.

43,903. You say the remedy for alkaline lands is deep ploughing and flooding?—I say it is my remedy.

43,904. Have you found it lucrative?—It is my remedy.

43,905. How deep did you go?—Nine inches.

43,906. That means about 3 inches below the tilth of the soil?—More than that.

43,907. The tilth of the soil is 6 inches, is it not?—I should take the tilth of the soil as being about 4 inches.

43,908. I can understand your flooding remedy where there are water-courses because then the water will drain off into other people's lands; but what happens to the flooding when it is done on your lands?—I shall be very pleased to show you the place if you like to come, and then you can draw your own conclusion. The water did not flow off the land; it remained on the land and sank down.

43,909. If it sinks down, will not the flooding of the land without any means of drainage do a lot of harm?—It did not in my case, nor does it.

43,910. We were told by a very eminent representative of the flour mill in Delhi that he has never seen pure wheat?—He can come to my farm and see plenty of it.

43,911. Who adulterates the wheat? Do you grow wheat of that quality containing 5 per cent. barley, 2 per cent. mud, and so forth?—My wheat is pure wheat; it has no barley.

43,912. I know big landlords generally grow pure wheat, but even a small landlord does not grow particularly dirty wheat?—No.

43,913. Who is the sinner? Are not the export firms the sinners in that respect?—Absolutely; they are the people who mix the wheat; they buy our good wheat and they make it into the parcel trade in Karachi.

43,914. It is my experience that at one time the middleman bought from me for Rs.5.12 and sold to them for Rs.5.8; is not that your experience, too?—No, I have not had that experience.

43,915. That was my experience; that evidently shows that it is the middleman who adulterates the wheat. Do not you think we ought to recommend something to remedy that. The remedy is very simple; it is that instead of calling the wheat, which contains 5 per cent. dirt and other things, standard wheat, we should call pure wheat standard wheat, and if anybody brings adulterated wheat there should be a discount. I asked users of wheat whether, if we gave them pure wheat, they would give us a premium; they said: "No, but we will charge you discount if the adulteration is more than 5 per cent."?—Yes, that is what they do. The remedy lies in the hands of the grower; the market is not going to give us the opportunities we want unless we stand out for them.

43,916. *Sir Thomas Middleton*: You have visited research stations in Europe and have taken every means to inform yourself of what is going on. Your criticism of the work at Lyallpur is that much more of it is necessary; I think the main criticism that you make is that more men are required?—Absolutely; I may be wrong, but to my mind Lyallpur is very largely an educational establishment.

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43,917. You would desire to see much more research done?—Yes, it is necessary.

43,918. What about the amount of demonstration work that is done? I do not refer to the quality, but to the amount of demonstration work; has the Agricultural Department got enough demonstrators?—I think the amount of demonstration work is practically nil, so far; outside Lyallpur I should say it is practically nil.

43,919. In your area you do not see agents of the Agriculture Department as demonstrators?—One periodically comes along; there are not enough of them to do anything.

43,920. Your most valuable perennial fodder is lucerne?—Yes.

43,921. But it dies after two years?—Yes.

43,922. Have the Lyallpur people attempted to discover the cause of its dying off?—I have sent them specimens more than once, but they have never been able to discover the reason.

43,923. Have they visited your land to see what is wrong?—No.

43,924. Can you explain the dying off in any way? Do you think it is due to waterlogging?—No, it is certainly not due to waterlogging. I have been reading a great deal about lucerne cultivation in different parts. Of course, our conditions are absolutely different from those of Australia or New Zealand. A tip I got out of a New Zealand book the other day was that it is rather against the life of the crop to take too many cuttings a year and to crop it too heavily; they say that the maximum cuts should be about three; I have been going up to six and seven cuts, and that may be one of the reasons. Another point is that they manure heavily.

43,925. Is it a case of weeds choking the lucerne out?—I am trying to keep my land as clean as possible and to put the lucerne on to clean land, but the weeds come up very quickly. I do not think that is one of the main causes of the lucerne dying off.

43,926. That is the usual cause?—Yes.

43,927. We have heard a good deal about the difficulty of getting repairs to iron implements done. You have your own repair shop; is the class of labour that you can get satisfactory?—In the way of *lohars* (blacksmiths), quite.

43,928. Then your difficulty arises with regard to cast-iron parts?—No, I have no difficulty in that respect at all. My labour is quite efficient but if I depended upon my village *lohar* there might be a falling off.

43,929. Where does the difficulty arise? Is it with regard to getting spares for cast-iron?—Yes, spares and parts; I keep parts of the shares; but my point is that the two ought to go together; the zamindar can repair his own country plough at once because it is made of wood, but unless the village *lohar* is trained to do these repairs to the iron plough, the zamindar cannot get his repairs done and often he cannot get the spare parts.

43,930. Have you got a welding plant?—No.

43,931. It has been represented to us that the increased size of polo ponies has prejudiced horse breeding in India; what is your view as to that?—Not in the least.

43,932. Has it made the game much more expensive and led to fewer polo ponies being kept?—I do not think so; there is not much difference between the keep of a 14 hand animal and the keep of a 14-2 hand animal.

43,933. What about the price?—I do not think there is very much difference in the price; it is the case of a good polo pony and a bad polo pony.

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43,934. Will you give us your view as to the size of horse the Indian breeder should aim at?—15 hands, no more; I have set my face against breeding bigger horses because I think they are unsuitable to this country and they are not suitable to the land; you have to breed animals with reference to what the land can turn out.

43,935. Have you any difficulty in getting bone in your stock?—No, none at all; lucerne and oat hay put the bone in.

43,936. Can you tell us of any districts in India in which attempts have been made to breed horses and complaint of lack of bone is made?—There are lots of places, but bone is simply a matter of proper feeding; at least that is my opinion.

(The witness withdrew.)

Mr. K. G. MITCHELL, A.C.G.I., A.M.I.C.E., A.M. Inst. I., Secretary, Communications Board, Punjab.

Replies to the Questionnaire.

QUESTION 4.—ADMINISTRATION.—(*c*) (*iii*) There is need for great improvement of rural roads in the Punjab particularly to facilitate marketing.

The improvements needed are—

(*a*) more metalled roads,

(*b*) improvement of existing metalled roads in District Board charge,

(*c*) improvement of unmetalled district roads, and in certain cases the provision of bridges, and

(*d*) improvement of village roads or lanes.

These improvements are, it is hoped, being brought about in the following ways:—

(a) *More metalled roads.*—With the present classification of roads, Government has begun a programme of metalling Class I (at the rate of 60 to 100 miles per year) which is a great advance on anything attempted for many years recently. At the same time the system of grants-in-aid for the development of Class II roads will result in some extension of the metalled mileage in this class at a rate of progress dependent on the resources of provincial and local funds; but District Boards must be looked to chiefly for the improvement of unmetalled roads. Apart from the ordinary Class II development grants there is a special road metalling programme entirely financed by grants-in-aid, but carried out by District Boards, in the Lower Bari Doab Colony; and, in the Nili Bar, a scheme being carried out by Government of providing metalled roads on a far more generous scale than hitherto attempted. This is being financed from the sale proceeds of waste land.

(b) *Improvement of existing District Board metalled roads.*—The new scheme of grants-in-aid to local bodies for the maintenance of Class II roads—the grant being conditional upon satisfactory maintenance—and the relief afforded by the transfer of certain roads to Class I, are already effecting considerable improvement; and, as a general rule, these roads should in future be adequately maintained.

(c) *Improvement of unmetalled district roads.*—This is a most urgent need. A beginning is being made, local bodies are now realising the practical limits to metalling, and the evils of over-building metalled roads, but in facing the inevitable alternative of improving unmetalled roads, many Boards appear to be at once disheartened at the magnitude of the task of making good the neglect of years, and sceptical of improvement. The Communications Board has therefore decided to meet the total cost of the improvement and subsequent maintenance of about

ten miles of such road in each district, as an experiment and a demonstration. It hopes to be able to follow this up with grants-in-aid on a liberal scale to any local body that, satisfied by the demonstration, wishes to adopt the method and is willing to provide a share of the necessary funds. At this stage it is not possible to estimate with accuracy the total expenditure necessary to put unmetalled roads generally in good order. It will be very large. Local bodies will also be helped with the construction of bridges as funds permit. Some of the more costly bridging and causeway projects have, however, at present to be shelved; they cannot be built piecemeal, and make too large a hole in the budget in any one year. It is, moreover, in the districts of hilly or broken country, which are unfortunately the poorest, that bridges are most badly wanted and most expensive. The richer districts have, in comparison, no such difficulties, and, as a general statement, the absence of bridges is not the outstanding bad feature of our roads.

(d) *Improvement of village roads.*—The Communications Board has endeavoured to initiate a campaign by offering two-thirds grants-in-aid to any District Board that will produce a scheme of improvement in, for a start, a *zail* or group of villages. Improvement will usually necessitate the acquisition of land for straightening or widening, and in some districts it is felt that this will only be possible as a corollary to the consolidation of holdings; in other districts village road improvement can proceed independently. The preliminaries have been slow. In one district work has been put in hand, and in another it will probably start before long. It is hoped that the current year will see several sample schemes in progress or completed. But a comprehensive policy has yet to be framed; it will need the active and sustained co-operation of the man in the village, which it is hoped will be stimulated by the samples now being attempted.

Need for more experimental work.—The sustained improvement of roads is primarily a matter of finance; with metalled or surfaced roads the limiting factor is the eventual maintenance bill. With the unmetalled road the cost of construction at present bulks largest, subsequent maintenance should be within the capacity of local bodies with the help of grants-in-aid. But my private view is that we are not devoting enough attention to experiment and research aimed at economy. A certain amount of experimental work has been done locally, but there is room for much more to determine *inter alia* the most economical form of road crust for the different conditions prevailing in different parts; the properties of soils in relation to earth roads; the possibilities of artificially treating or blending soils, and the possibilities of "pounded roads," "trackways" and other devices. Recent years have seen the start of a great development of our roads, and in the early future these necessary matters will, it is hoped, be taken in hand.

Note.—A fuller description of the Punjab roads and of the system of classification is given in the Punjab memorandum for the Royal Commission.

QUESTION 20.—MARKETING.—In the Punjab memorandum for the Royal Commission I discussed marketing in relation to rural communications. My knowledge of this intricate subject does not enable me to discuss in detail the technicalities of marketing; for this first hand knowledge is necessary. Subject to this reservation I would reply:—

(*a*) The facilities offered by the latest type of market town designed for the Nili Bar Colony, will it is believed be satisfactory. As each new colony has been developed the defects apparent in the earlier *mandis* have been corrected; thus the later are probably the better. But, as far as I am aware, the markets of the great canal colonies, and probably many others, are capable of offering satisfactory facilities. The defects lie in bad approaches, and often in very bad roads and insanitary conditions within the town area. The improvement of the approaches has already been referred to: the improvement of small town administration is partly a matter of finance. Insanitary conditions, and the damage done by rats and so forth, not only militate against efficiency in the market as a market; but the town fails to be, as it should be, a model to the village. A possible general improvement would appear to be the separation of grain storage and residences by the provision of rat proof granaries, but the existing arrangement is cheap. A more radical change by the introduction of elevators with the standardisation of grade, cleaning, and possibly with the eventual elimination of the cost of bags, should mean a better price for Punjab wheat. But the question needs very careful consideration.

(*b*) The system of marketing through the intermediary of the village *bania* when the cultivator is debarred from direct marketing by remediable circumstances is unsatisfactory. Even now, and more so with projected railway developments, it is usual for the cultivator in the fertile plains to be within twelve miles of his market town. Within this radius he should, with reasonably good roads, be able to market direct. One of the aims of our road policy is to make this as easy as possible. The very small holder will presumably have to fall back upon co-operative marketing. The improvement of roads, the improvement of cattle, and co-operation must all play their part in the elimination of superfluous operations and transactions.

Oral Evidence.

43,937. *The Chairman*: Mr. Mitchell, you are Secretary, Communications Board, Punjab?—Yes.

43,938. We have your note of evidence which you have sent in to the Commission. Would you like to make any statement at this stage in addition to what you have already sent in, or may we ask you a few questions?—I have nothing to add to my written statement.

43,939. You state on page 93 of the Punjab memorandum*: "It must be admitted that, at present, the production of fruit, potatoes and other crops is seriously handicapped by bad and expensive transport." Is it because the particular districts in which those things are grown are badly served in the matter of roads?—Yes.

43,940. Is it part of your programme to put that right?—As I have explained in the memorandum, we are at present concentrating on the richer districts in the plains.

43,941. From paragraph 34, page 105 of the memorandum* I judge that you think the opening for tramways is very limited?—Yes.

43,942. Is any experimental work being done in that direction?—Not at present, we are hoping that new railways will fill the gaps; if not, we shall have to re-consider tramways.

43,943. Do you expect motor transport to come in in the near future in the Punjab for carrying agricultural produce?—Not for carrying agricultural produce, that is the ordinary bulk crops.

43,944. The cultivator has his bullocks, and it would be no gain for him to pay a high rate while his bullocks are doing nothing?—Not only is that the case, but with his own transport he is free to market his produce whenever he wants to.

43,945. Have you had any experiments or has any firm carried out experiments in track or half-track vehicles in the Punjab?—No; but a

*Memorandum prepared by the Punjab Government for the Commission (not printed).

proposal was submitted by a firm which was passed on to the North-Western Railway authorities, who were, it was thought, best equipped to manage such an undertaking, especially as through booking would be beneficial; but they have, I think, dropped it for the present.

43,946. Through booking from the village to the town?—In certain cases these subsidiary services might lead to the creation of new markets off the railway and in that case this would be beneficial.

43,947. On pages 111-112 you give the new classification of roads. Class I roads are a charge on provincial revenues; class II partly a charge on the provincial revenues and partly on local funds. Can you tell us at all the total amount granted to local authorities in relief?—In the current year about 16 lakhs have been given, that is to say 7 lakhs is relief in the matter of maintenance, and the rest is for development.

43,948. Entirely in class II?—Yes.

43,949. And then the balance, class III, are entirely under the District Boards?—Yes; a further 1,000 miles (300 metalled) of class II roads will, by the next financial year, be removed from the charge of the District Boards, and placed in class I.

43,950. Was there a serious deterioration of the roads as a result of their being handed over to the District Boards?—Deterioration was gradual for one reason or another, but was aggravated and came to a head by the rise in prices and increase of motor traffic following the war.

43,951. Has this change which you have here described, according to which various roads have been charged on provincial revenues, had the effect of taking away the responsibility for the roads altogether from certain District Boards?—No.

43,952. They have got quite enough to practice on?—Yes.

43,953. That is an important consideration, and you do pay regard to the educational value derived by members of these Boards by their having responsibility for roads?—Yes; not more than 25 per cent. of the mileage is in class I.

43,954. A good proportion of the commercial roads have passed from class II into class I?—We do not expect a further transfer save in exceptional cases, for another fifteen years. We have now got 1,750 miles unmetalled in class I which we have recently taken over and with our present programme it will take about fifteen years to metal that mileage and put it in first-class order.

43,955. Would certain roads in class III pass into class II?—Possibly; as a matter of fact we will probably in course of time remove the distinction between class II and class III roads. It has been suggested that the system of providing grants-in-aid for class II roads may lead to the neglect of class III roads and Government intend eventually to remove this distinction. The difficulty at present is that the records of local bodies are faulty and it is difficult to obtain accurate figures for class III roads upon which to frame a programme showing what it will cost to extend grants-in-aid to all class II and class III roads.

43,956. So far as the ordinary cultivator is concerned he would probably derive more benefit from a substantial improvement in the condition of class III roads than from any other step; for him these class III roads constitute the bottle-neck connecting the villages?—In a sense, yes; but classes I and II are the roads leading to markets upon which traffic concentrates; I might explain that class III roads are in charge of District Boards, but village roads are the property of the village.

43,957. On page 2 of your note of evidence, in answer to our Question 4 (*d*), you say that the Communications Board has endeavoured to initiate a campaign by offering two-thirds grants-in-aid to any District Board which would produce a scheme of improvement in a chosen group of villages. First of all, what is the Communications Board?—It is a Board composed of 12 officials and seven non-officials, the officials representing all those Departments of Government which are likely to be interested in the development of communications. It is advisory with regard to the classification of roads and suggests railway extensions; it is also to a certain extent executive in that it has taken over the supervision of class II roads and directly finances the improvement of road communications other than class I.

43,958. How are the non-official members chosen?—They are appointed by the Governor on the recommendation of the Minister for Agriculture, who is President of the Board.

43,959. Has the Board any fund of its own?—Yes, we get these 16 lakhs about which I have told you.

43,960. Does the Board present a budget?—Yes, I submit a budget for the Board; certain proposals are approved of for the coming year and they are submitted in the usual way to the Government in the shape of a budget which the Public Works Department incorporate in their own budget.

43,961. In the matter of any particular offer that has been made, has any good followed?—We have just completed something in that direction. In Muzzafargarh, for village road improvements we offered 75 per cent., and I have just received news that they have finished improving certain village roads aggregating 100 miles; we have also got a scheme in Sialkot District of about 40 miles which we expect to start very soon. In one or two cases the intention was to do this work, as part of, or with the consolidation of holdings, but that has not matured. I do not know what has happened to these cases but I am inquiring.

43,962. Have you anything to tell the Commission about the scheme for the development of agricultural railways?—That is a matter which Colonel Walton will prefer to explain, and I understand that he is appearing before you as a witness, in which case all the information that is desired will be supplied by him. I can, however, give you an outline of the scheme.

43,963. It was suggested that you were the appropriate officer?—As I say, I can give you only the outlines, whereas Colonel Walton will be able to give you fuller and more detailed particulars.

43,964. *Sir Henry Lawrence*: Are there any tolls on roads in the Province?—Yes, on one road only, namely the Rawalpindi-Murree road.

43,965. Have they ever been levied on any other road or roads?—I do not think so; there are certain tolls on boat bridges and ferries in one or two places; but the road which I have just mentioned is the only one I know of on which a toll is levied. For the eighteen years that I have been in this Province I have never heard of any case other than that.

43,966. Has the policy of developing your roads by instituting tolls been considered and rejected?—I could not say that it has been considered very seriously; it was considered *prima facie* and rejected; at least we have never got to the point where we considered that it was worth while laying any such proposals even before the Communications Board for discussion, because it was felt that the agriculturist who is the chief taxpayer is the chief user of the road and there is no particular object in imposing a separate cess.

43,967. You recognise that the construction and improvement of roads in England was originally based on the toll system?—Yes.

43,968. And that that system applies in various other provinces in India?—I am not aware of that.

43,969. *Sir Thomas Middleton*: We have had a good deal of evidence as to the deplorable condition of village roads. Do you think it would be possible by any scheme to get villagers to combine to improve their own roads?—Under the Punjab Village Panchayats' Act it is one of the duties of the village *panchayats* to look after village roads, but so far I do not think it can be said that they are functioning in that respect at all.

43,970. I understand the difficulty is that the repairing of roads is a matter for the village menials and that the cultivators will not themselves combine to do repair work?—Possibly so, but I do not know.

43,971. *Sir James MacKenna*: You are an officer of the Public Works Department?—Yes.

43,972. What are your duties as Secretary of the Board? Do you exercise the power of inspection?—Yes; under the rules as they stand I am the officer who is to give technical sanction to all road and bridging projects of District Boards in respect of class II and class III roads.

43,973. Are any members of the Board elected by the Legislative Council or are they all nominated?—They are all nominated.

43,974. What is the position with reference to finance? When a work is passed by the Communications Board, is that the end of it, subject to finance being available?—The position is this. Once a road is, on our recommendation taken by Government into class I, Government, in the Public Works Department, budgets for funds; the execution of the class I programme is entirely in the hands of the Government in the Public Works Department though the Communications Board may be consulted about it, or tender advice *sponte sua* with respect to other roads we frame our budget and allot grants. I am responsible for the proper execution of the work carried out by local bodies with these grants.

43,975. *Professor Gangulee*: Are District Boards represented on your Communications Board?—Yes; I could not give you the exact figures, but it includes several members and one or two of the Vice-Chairmen of the District Boards.

43,976. I see that the District Boards of your Province have lately raised their local rates; are they spending more money on roads than they used to?—Yes.

43,977. You refer to village *panchayats*. Have the village *panchayats* necessary funds for looking after village roads?—I understand they have power to raise funds, which they do not exercise.

43,978. They can raise a local cess?—Yes.

43,979. You do not know whether they utilise that provision in the Act or not?—I gather that they do not.

43,980. *Mr. Calvert*: You point out there is need for more experimental work. Are you now carrying out certain experiments?—Not now.

43,981. Have you any funds to carry on these experiments?—There is a difference of opinion. I hold that experiments should be rather centralised at the headquarters of the Government; the other view is that experiments should be left very largely to the Executive Engineers and people in the districts and that view at present prevails.

43,982. Have you worked out the relative costs of transport on metalled and unmetalled roads to show that metalled roads are really economic?—No.

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43,983. Could you tell us what happened to the scheme in Sholapur District for raising a loan to meet all the permanent expenditure on certain road improvements?—I cannot give you the exact figures, but I think it involved an expenditure of 7½ lakhs of which 25 per cent. is given by us as grant-in-aid, 25 per cent. in the form of loan, and 50 per cent. is found by the District Board from its own resources.

43,984. Was that loan sanctioned?—Yes; the work is in progress.

43,985. In reply to Sir Henry Lawrence did you say that there were tolls on any bridge in the Punjab now?—The custom prevails on boat bridges in certain parts, for instance on the Beasin Kangra and the Jhelum at Khurhab.

43,986. But not on permanent bridges?—No.

(*The witness withdrew.*)

The Commission then adjourned till 10 *a.m. on Friday, 4th March*, 1927.

Friday, March 4th, 1927.

LAHORE.

PRESENT:

THE MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE
Mr. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc. } *Co-opted Members.*

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } *Joint Secretaries.*

Lt. Col. W. C. H. FORSTER, M.B., D.P.H., I.M.S., Director of Public Health, Punjab.

Replies to the Questionnaire.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*a*) The Punjab with monotonous regularity heads the list of provincial mortalities, this unhappy position being due to the incidence in epidemic form of preventable diseases of which the more important are plague, malaria, smallpox and relapsing fever. The problem of improving the provincial mortality rate is, therefore, a problem of preventing such diseases and consequently resolves itself into a consideration of general sanitation. The population being in the proportion of 90 per cent. rural to 10 per cent. urban, it follows that substantial improvement in the provincial death-rate will only be effected by substantial improvement in rural sanitation. The term "rural sanitation" requires some form of conventional definition, but in the present instance, instead of attempting a comprehensive definition, it will be convenient to consider from the remedial point of view firstly, the general machinery external to the district for dealing with sanitary problems and secondly, the machinery within the district itself.

MACHINERY EXTERNAL TO THE DISTRICT.

(1) Public Health is at least as important as Education and the Director of Public Health should occupy the same position in relation to the Minister and the Governor as the Director of Public Instruction. The Director of Public Instruction is officially Under-Secretary to the Minister and in consequence deals directly with the Minister, has a weekly interview with the Governor, and all files affecting his department pass through his hands.

With the Public Health Department the position is otherwise. The Director of Public Health prepares schemes for the improvement of the Public Health, submits them to a lay Secretary, and that is the end of the matter for the time being. He may be called in for a verbal consultation with the Minister, but he does not see the file, takes no active part in the discussion which ensues on his proposal, and may only see the Minister or Governor by request. In due course he receives an intimation to the effect that the proposal has been accepted or rejected. This system, which excludes

expert knowledge of Public Health problems from Government discussions and which ensures that the Public Health shall always be at the mercy of chance criticism by lay men has been strongly inveighed against by the British Medical Association. The matter was represented to the Secretary of State who sympathetically undertook to press on the Indian administrations the advisability of reform in this respect, but so far as the Punjab is concerned the position is worse than it was nine years ago.

(2) All officers of the Indian Civil Service at the commencement of their service in India are given a preliminary training in such aspects of their work as civil administration, legal procedure, revenue, etc., but they are not given an elementary training in Public Health administration. I consider that every Indian Civil Service officer should be given a preliminary training which would provide him with a working knowledge of Public Health administration and its vital importance to the community as a whole. It is no reflection on an Indian Civil Service officer to say that he starts his career with no knowledge of Public Health administration or its importance, and it would be no reflection on him to give him a training which would enhance his value as an Administrator. The fate of a district in matters sanitary is very largely in the hands of the Deputy Commissioner who can hardly be expected to display enthusiasm for a subject which he does not understand and which his official training has led him to believe is of minor importance and not worth much of his time and energy. I have reason to believe that the proposal would be acceptable to the Indian Civil Service and I know it would greatly raise the standard of attention accorded to rural sanitation.

(3) *Finance.*—Apart from certain obligations accepted *in toto* as a provincial charge, Public Health measures in the rural areas are financed partly from the income of the District Board and partly by grants-in-aid from provincial revenues. Direct taxation being as unpopular with the Oriental races as it is with the Latin the principle of unlimited rating is not accepted. For its income the District Board is dependent on a rate which is limited to a maximum at present not exceeding one-eighth of the assessed rateable value of the area within its jurisdiction. As the assessment is only reviewed at considerable intervals—thirty years or so—and as most District Boards have arrived at the maximum leviable rate it may be taken for all practical purposes that the income of the District Board is fixed and inelastic. Consequently there is a general scramble for money amongst the spending departments of the Board and, human nature being what it is, only those projects which command the support of influential members secure adequate financial provision. Until recently Public Health was not represented on the District Boards and at the time of writing, although this will be remedied in the coming financial year, it is represented on less than 12 out of the 29 Boards. The chances of Public Health receiving adequate financial provision can be gauged accordingly. Public Health is in fact grossly neglected and such areas within a district as receive special treatment usually do so in consequence of the accident of association with some influential member of the Board. It may be taken as axiomatic that whilst every District Board will cheerfully incur bankruptcy on account of schools no District Board is willing to spend the smallest moiety of its income on Public Health projects which do not offer some personal advantage to individual members of the Board. The sub-joined table shows how Public Health is treated financially in the case of one of the most prosperous and advanced districts. With regard to the actual expenditure it will be noted that although this district was afflicted with an epidemic of plague responsible for over 400 deaths weekly, and also with a coincident epidemic of smallpox, the total expenditure on Public Health for a rural population of 898,609, was under £1,300.

STATEMENT SHOWING EXPENDITURE ON PUBLIC HEALTH, WITH PERCENTAGE TO TOTAL INCOME, BY THE DISTRICT BOARD, LYALLPUR, FOR QUINQUENNIUM, 1921-22 TO 1925-26.

Year.	Total income of the Board.	Expenditure on Public Health.	Percentage.	Remarks.
	Rs.	Rs.		
1921-22	12,00,929	11,107	0·924	
1922-23	10,83,086	9,484	0·875	
1923-24	11,93,678	8,237	0·690	
1924-25	11,50,134	16,843	1·46	
1925-26	14,14,104	17,551	1·24	

Although the Province is always on the verge of an epidemic, financial provision for anti-epidemic measures, unless the Deputy Commissioner is insistent, is always hopelessly inadequate. When an epidemic disease breaks out the District Board as a general rule does nothing on the plea that it has practically no funds—which is true in the sense that it has made no provision for the contingency—and that if it did spend the little money budgetted for anti-epidemic measures on this particular outbreak there would be no money left for the next outbreak of epidemic disease—a form of sophistry which appears to carry great weight. Government provides a certain sum of money in the Public Health budget for the purpose of assisting District Boards in combating outbreaks of epidemic disease by means of grant-in-aid, but a grant-in-aid is only supposed to be given when the District Board has exhausted its own budget provision for anti-epidemic measures and consequently a difficult position arises. In practice the Director of Public Health, anxious to get something done, offers the District Board a lump sum grant and this may be accepted. Not infrequently, however, the District Board, possibly in the hope of avoiding inconvenient enquiries into its budget provision, may stultify the whole scheme by postponing consideration of the matter "until the next meeting." As meetings only take place at monthly intervals, by this system of procrastination consideration of the subject can be postponed until the epidemic has either died out, at a cost in human life which never disturbs the District Board, or assumed dimensions which make further procrastination impossible.

There is another aspect of this financial question which requires consideration. The Public Health Department periodically submits to Government schemes having for their object the creation of a permanent preventive organisation for rural circles but such schemes are adversely criticised on the ground that they do not reveal any *pro rata* effort on the part of the District Boards. As District Boards will not make such effort, and as the Public Health Department cannot compel them to do so, the general result is bad for the Punjabi peasant who contributes his quota to the highest provincial mortality in India.

My remedy for his state of affairs is as follows:—

(i) After proper enquiry Government, in the case of each district, should fix for a term of years, either in form of a percentage of total income or a definitely named sum, the budget provision the District Board must make in respect of Public Health.

The budget of the District Board being subject to approval by the Commissioner of the Division, this change could be effected by executive order.

(ii) Government should take to itself the power of imposing, and if necessary collecting and expending on behalf of the District Board, a special

rate for Public Health purposes over and above the fixed maximum not exceeding 1/32nd of the assessed rateable value of the area controlled by the District Board.

Once the District Board is definitely given to understand that human life is of value, that it will no longer be allowed to assess human life at its own valuation, and that if it does not concentrate on improving the Public Health the area as a whole will be liable to excess rating, there will be a marked improvement in the present state of affairs. On the other hand once Government has definitely decided what must be the local contribution towards public health measures it will be in a position to decide the extent to which it should supplement that effort from Provincial revenues.

(4) *Law.*—Legislation representing the combined effort of a community brought to bear on a particular question, and combined effort being the strongest weapon civilisation has furnished, it is but natural that preventive medicine, which is concerned to regulate individual and group action in the interest of the communal whole, should derive its authority from legislation.

Quite apart from any question of new statutes I am strongly of opinion that in the interests of the rural population our existing public health legislation requires to be put on a different basis. To make the point clear it will be necessary to give an outline sketch of the existing administrative areas of the Province.

The unit is the district, analogous to the English County, the Province being divided up into 29 Districts. The District is sub-divided into *tehsils*, a *tehsil* being analogous to an English Rural District, and the *tehsil* is further sub-divided into *zails*, the *zail* being analogous to the English parish.

In a district there may be any or all of the following classes of urban areas:—

First Class Municipality analogous to the English County Borough.
Second Class Municipality analogous to the English Municipal Borough.
Notified Area, Small Town, analogous to the English Urban District.

Stated in tabular form the comparison with England is as follows:—

Punjab.	*England.*
The District	The County.
Urban Areas.	
First Class Municipality	County Borough.
Second Class Municipality	Municipal Borough.
Notified Area... ... ... / Small Town	... Urban District.
Rural Areas.	
The *Tehsil*	The Rural District.
The *Zail*	The Parish.

English Public Health legislation, which in principle if not in substance stands as a model, is on the following principle.—It lays down what shall or shall not be done in regard to major sanitary matters and then for each administrative area nominates a local authority termed "a Sanitary Authority" responsible for the execution of the law within its area. Thus, if an act is defined by English Public Health legislation as constituting a nuisance, then that act is a nuisance throughout the whole country and it is the duty of the local sanitary authorities to abate such nuisances within their areas.

Punjab Public Health legislation, and all public health legislation in India known to me, is on a totally different principle. It first defines an area and then in regard to major sanitary matters lays down what shall or shall not be done in that area. Further the public health provisions of the various Acts differ greatly for different classes of areas, and large areas are practically untouched by public health legislation. Thus nuisances are only legislated for within municipal limits and legally speaking it is impossible to commit a nuisance in any area to which the Municipal Act does not apply. Similarly failure to notify a listed infectious disease is an offence within municipal limits and not an offence outside such limits. This illogical and extremely inefficient system of legislation has led to a series of Acts, each of which is designed to take in some of the area previously untouched and to make some sort of provision for public health within it. Thus in addition to the public health provisions of the Municipal Act we have the public health provisions of the District Board's Act, Small Town's Act and the Panchayat's Act, and in other Provinces there is even legislation to deal with individual villages.

What is required and urgently required is a consolidating Public Health Act on the lines of the English Act of 1875 which will regulate major sanitary matters for the Province as a whole and constitute local Sanitary Authorities for the existing administrative areas. If this be done, and sooner or later it must be done, it will at once become evident that in the rural areas there is a large gap which must be filled by the creation of an entirely new local Sanitary Authority for the *tehsil*. Repeating the comparison with England I state the local Sanitary Authorities for the existing administrative areas:—

Punjab.		*England.*	
District—District Board		County—County Council.	
Urban Areas.			
1st Class Municipality.	The Municipal Committee.	The County Borough.	The Urban County Council, or The Borough Council.
2nd Class Municipality.		The Municipal Borough.	
The Notified Area Small Town.	The Notified Area or Small Town Committee.	The Urban Areas	The Urban District Council.
Rural Areas.			
The *Tehsil—Nil*...	...	The Rural District ...	The Rural District Council.
The *Zail—Nil* ...	...	The Parish	The Parish Council.

I would strongly urge the creation of *Tehsil* Boards or committees, the title is immaterial, exercising functions analogous to those of the English Rural District Councils and related to the District Board as the English Rural District Council is related to the County Council. The present system whereby the District Board functions as the Executive Sanitary Authority for all the rural circles of the district operates to the disadvantage of those circles, the unit being many times too large both from the point of view of area and population. Take, for example, the district of Ferozepore with an area of 4,286 square miles and a population in the rural circles of 986,423. It is absurd to suggest that any Board can function efficiently as an Executive Sanitary Authority for such an area and population. In the circumstances it is not surprising that rural sanitation as a whole is grossly neglected, and that if any rural circle is favoured with special treatment, it owes it to the accident of association with some particular interest

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commanding influence in the Board. *Tehsil* Boards, if properly constituted, would ensure equal treatment for all the rural circles of the district, and as the *tehsil* is recognised as a necessary administrative area for the purpose of general administration, there is no reason why it should not be recognised as a necessary administrative area for efficient public health administration. I would not, however, go below the *tehsil*. English administration has found little use for the Parish Council and a corresponding institution in the Punjab would serve no useful purpose.

In addition to consolidating public health legislation on the line suggested I would press for inclusion of the principle that in matters of grave importance, where the Executive Medical Officer of Health is unable to obtain satisfaction from his local Sanitary Authority, the onus of deciding for or against remedial action, and of compelling the local Sanitary Authority to take such action when necessary, should be on the Ministry of Health. This principle is merely an application of the general principle that it is the duty of a Government to govern. Local Government is an arrangement for administrative efficiency conceived in the interests of the general public, which interests the supreme Government is concerned to guard, but in setting up Local Authorities and delegating to them certain powers the supreme Government does not and cannot part with its right and duty to compel a recalcitrant Local Authority to do what is necessary in the interests of the public, or in alternative act for it.

Existing public health legislation in the Punjab belongs to the Pre-Reform era and is designed *inter alia* for the express purpose of enabling Government to disavow all responsibility for action or inaction in regard to matters sanitary. In the case of the Municipal Act, which is the type Act, the onus of action to remedy matters which the local Sanitary Authority refuses to remedy is thrown on the Commissioner and the Deputy Commissioner, whose action in turn is subject to review by Government—an ideal method of securing inaction. Public Health, however, is now a transferred subject controlled by a Minister directly answerable to the Legislative Council, with a strong advisory personnel at his service, and the responsibility for action or inaction should be his. The general public through its elected representatives should be in a position to know definitely who is responsible for action or inaction and to decide its attitude accordingly.

Acceptance of this principle, which is recognised in English legislation, would greatly strengthen the position of the Minister by removing to the purely legal sphere matters which, if relegated as at present to semi-cabinet decision, might be kept pending indefinitely.

District machinery.

For the suppression of outbreaks of epidemic diseases, the following agencies are necessary:—

(1) A reporting agency which can be relied on to give prompt information of the occurrence of epidemic diseases.

(2) A skilled agency for the application of appropriate anti-epidemic measures.

The district machinery is seriously in defect in respect of both agencies.

(1) The existing reporting agency is a village official who is supposed to report to the nearest police post, and in certain specified cases, as, for example, cholera, simultaneously to the nearest dispensary. Even if this arrangement were scrupulously observed by the village officials, it would be unsatisfactory from the point of view of the District Public Health agency because of the great delay involved. Police posts are few and far between —there are only 418 in the whole Province—and in large tracts of country dispensaries are fewer still. Excluding the case when the dispensary is informed, invaluable time is lost whilst the information is being conveyed

from the village to the police post and thence to the District Public Health agency. Even when the dispensary is informed the result may be very unsatisfactory, as will be explained later.

In practice, however the arrangement is seldom observed by the village officials, and I will quote two recent examples to show what ordinarily happens.

Last year an outbreak of cholera occurred in a village in the Northern Punjab. The outbreak was not reported by the village officials, but eventually rumours reached the police post that something was wrong and the information was passed on to the nearest dispensary and to the District Medical Officer of Health. By that time so many deaths had occurred that the inhabitants had begun to fly from the village. The outbreak was suppressed in a few days by the District Public Health Department, but in the meantime the fugitives, carrying infection with them, had started a series of secondary outbreaks all up the line. Cholera is comparatively easy to deal with, and if the outbreak had been reported at once it could have been suppressed very quickly; there would certainly have been no secondary epidemics.

Again, in the case of plague, villages infected after the 15th April are listed for special treatment during the off-season—August to October—for the purpose of preventing recrudescence. Last year a special staff was employed in the Ambala Division—the worst infected area—to ensure thorough application of these off-season measures, but in spite of rewards for information, payment for special messengers, etc., it was found by the end of October that a number of the villages in which plague occurred had been infected after the 15th April but had not been listed for special treatment because the villages had not reported the infection.

Without prompt information, a public health agency is powerless to deal with epidemic diseases, and it is obvious that the present system in the rural circles requires overhauling. Whatever system be adopted, it must be recognised that the primary reporting agency must always be the village official. The question is—to whom should he report? Reporting to police stations is unpopular, and the alternative of reporting to revenue *patwaris* has been tried and found wanting. I am of opinion that the remedy is to be found in the village schoolmaster for the following reasons:—

(*a*) Schools greatly exceed in number any other class of possible reporting station, and their number is rapidly increasing. In the Karnal District, for example, in a year or two the number of schools will be ten times as great as the number of *patwari* circles and forty times as great as the number of police posts.

(*b*) The village schoolmaster is in a position to know sooner and better than anyone else what is happening in the villages from which his pupils are drawn.

(*c*) The village schoolmaster runs the rural post office and knows the best and quickest route by which information can be transmitted.

(*d*) By co-operation with the Education Department schoolmasters receive an elementary training in hygiene and sanitation, and so, in addition to acting as a reporting agency, they could render first aid in dealing with epidemic diseases pending the arrival of the skilled agency.

This scheme has been discussed informally with the Education Department, and it is understood that no objection would be raised to it.

(2) The question of the skilled agency for the application of anti-epidemic measures being of vital importance to the rural population, indeed the possibility of reducing the provincial mortality to reasonable dimensions is very largely dependent on the handling of this matter, I shall deal with it at some length.

Leaving out of consideration constructive works undertaken by engineers and architects, the Public Health work of a country is done by the general

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body of Medical Practitioners, the superior control of whom is secured by legislation and executed by a small body of specially trained executive officers known as Medical Officers of Health. The General Practitioner, by means of the death certificate, which states the cause of death, provides the basal data for all measures of Public Health; he reports the occurrence of infectious disease to the authority responsible for dealing with the wider issues of such cases and at once himself takes the necessary steps to prevent any further spread of such disease; in the case of insanitary conditions requiring remedial constructive works he is usually the person who draws attention to them; he complies with all requests or instructions transmitted to him by the various Public Health agencies; and generally speaking he works up to the great principle that the primary object of medical science is the prevention of sickness and mortality.

The degree of efficiency with which such Public Health service is rendered will depend in the first instance on the way in which the General Practitionerate is spaced over the country. If, for example, the rural areas are devoid of Medical Practitioners, no Public Health service will be rendered in those areas. In all advanced countries the necessity for such service in the rural areas is accepted, and in order to permanently secure such service the country is parcelled out into workable areas, for the service of each of which a General Practitioner is given a subsidy from public funds sufficient to secure him a livelihood. In this way a minimum medical service for the rural areas is secured, and in countries where the rural areas can support additional independent practitioners still greater service is secured.

The service which the subsidised practitioner must render in return for the subsidy varies in different countries, but, generally speaking, in addition to such service as every Medical Practitioner is required by law to give—certifying the cause of death, reporting infectious disease and dealing with it, etc.—he must give free medical service to the poor and perform certain specified Public Health duties, such as vaccination.

This is the system in vogue in England, and as England possesses the highest trained Medical Practitionerate in the world closely dotted all over the country, the degree of Public Health service she receives is correspondingly high and properly reflected in her death rate. In recent years the number of medical men and women employed exclusively on Public Health duties and paid from public funds in England has greatly increased, but this does not affect the general argument. In the Punjab, however, the General Medical Practitioner is unknown in the rural circles, which in consequence are deprived of the public health service ordinarily rendered by such practitioner. As the rural circles do not offer the necessary inducement in the way of private practice to attract medical practitioners, the Public Health Department, after the great influenza epidemic of 1918, put up a scheme to remedy the deficiency. The scheme aimed at providing a General Medical Practitioner for every 100 square miles of rural territory who would receive a subsidy from public funds sufficient to secure applicants, and in return would be under obligation to render certain specified services within his area. These obligatory services included:—

(1) Free medical service, including medicines for the poor.

(2) Medical attendance on specified District and Government servants.

(3 All public health duties within his area, such as vaccination, plague inoculation, anti-epidemic measures, etc.

He was to tour his area, visiting the villages in it at prescribed intervals, to comply with the instructions of the District Medical Officer of Health, and to supervise the work of any special public health staff drafted into his area. This subsidised practitioner was to be the servant of the District Board, which would receive a grant from provincial revenues towards the subsidy.

This scheme, which could have provided the rural circles with a Medica Practitionerate under obligation to perform efficient public health duties was approved by the Sanitary Board, but has finally taken shape in a form which completely defeats the object of the scheme. In consequence of the belief so strongly held in this Province that treatment is better than prevention, and that treatment can only be adequately secured by means of a hospital organisation, what is actually being done is to provide a petty hospital with one Medical Officer in charge for every 100 square miles of rural territory. This system, pushed to its logical conclusion, would require the establishment of a hospital in every village and in several parts of very large villages.

Hospital organisation is a thing unto itself, but, quite apart from any question of the value of treatment, a hospital organisation can never replace a General Practitionerate, because, by the nature of the case, the patient must come to the hospital, as the essential staff, being required for duty at any time within the hospital, are tied to it. The inability of this organisation to serve the needs of the rural areas was fully demonstrated in the course of the plague epidemic of 1926 and in consequence has been strongly disapproved by the District Boards. What actually happened was this. With plague raging in the villages of the Ambala Division and the people dying like flies, the District authorities naturally assumed that the Medical Officers in charge of these new rural dispensaries, as they are called, would be available for field work against plague. In this, however, they were wrong. These dispensaries being petty hospitals with beds the Medical Officer in charge of each was quite correctly under orders not to leave his hospital except on the gravest emergency, and that he must be constantly on duty for specified periods during the forenoon and afternoon. In fact, so far as the dispensaries were concerned, if plague cases were brought to them, or people desiring inoculation were brought to them, they could function, but the Medical Officers could not leave the dispensary to attend to plague cases, inoculate against plague, or do any of the essential field plague work. In one district the authorities took the extreme step of peremptorily shutting up these dispensaries and turning the staff out to work where they were really required, but in other districts it was necessary to put down a duplicate medical staff to do the work which would have been done by the Medical Officers in charge of rural dispensaries had they been appointed under the terms of the original scheme. In consequence it is not surprising that four of the five District Boards of the Ambala Division have passed resolutions calling on Government to revert to the original scheme, and their example is being followed by other District Boards elsewhere in the Province which had similar experience. If this system of endeavouring to meet the requirements of the rural areas by means of petty hospitals is persisted in, then it is obvious that a duplicate staff must be put down to carry out the duties which only a Medical Practitioner, free to move about as necessary, can perform—which would mean the separation of therapeutic and preventive work down to the very last point, namely the practitioner. No country could afford such an expensive and inefficient system, and therefore, until it is recognised that hospital must be limited to the service of the needs of the General Practitioner and that such Practitioner combines in himself and provides practically all the preventive and therapeutic service of a country, the prospect for the Punjabi peasant is extremely gloomy. The position could be remedied to meet the wishes of the District Authorities and the requirements of the rural areas without any additional expense whatever and without in any way clashing with the general principles of administration. All that is required is to convert the petty hospital buildings into a suitable dwelling place for the Medical Officer, prescribe his duties as laid down in the original scheme, and give the Government grant towards the subsidy from the Public Health budget instead of the

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Medical budget. If this be done then the rural areas will have dotted over them at convenient intervals medical men to whom the village schoolmaster can report, whom the District Medical Officer of Health can rely on for all the essential Public Health services, and who will give the sick treatment in no way inferior to that which they receive under the petty hospital scheme. Further, if my proposal as to the *Tehsil* Boards be adopted, one of these Medical Officers, as in the case of the English Rural Districts, would function as deputy Health Officer for the *tehsil* under the District Medical Officer of Health.

Before leaving this subject it is necessary to expose some of the fallacies inherent in the assumption that a rural hospital organisation could ever materially affect the death rate of the Province.

First in the case of plague. For the 24 years 1901 to 1924 the total number of deaths from plague in the Punjab was, in round numbers, 3,000,000, the average annual number being 125,000. The case mortality for untreated cases of plague in the Province is generally estimated at 70 per cent., which means in round numbers there were 4,300,000 cases of plague during the test period. Up-to-date no method of treating plague which is capable of appreciably affecting the case mortality has been discovered, but to give the hospitals every advantage we will assume that hospital treatment could reduce the case mortality to 65 per cent. If, therefore, a hospital organisation capable of treating everyone of the 4,300,000 cases had been in existence there would still have been a total death roll of 2,795,000, equal to an annual death roll of 116,000 as against 125,000—a saving of 9,000 lives per annum, which total would only affect the provincial rate by a decimal point. The hospital organisation for such a purpose would mean the establishment of very large hospitals in a very large percentage of the number of villages in the Province, which is not a practical possibility. On the other hand we know from experience that a General Medical Practitionerate of moderate dimensions carrying out anti-plague measures could have greatly reduced the incidence of plague and in this way have materially affected the death rate.

Secondly, malaria. The acute malaria season is practically limited to three months, and although treatment is notoriously efficient in the case of malaria yet, as in the case of plague, in order to treat anything like the number of affected persons large hospitals would be required in most of the villages. At present, as the result of this hospital system, the District Authorities are driven to employing all and sundry—vaccinators, sanitary inspectors, revenue officials, private persons—for the distribution of quinine to the sick.

Thirdly, relapsing fever. Here again treatment is notoriously most efficient but unless large hospitals are established in the villages of the infected areas the only method of bringing treatment to them is by means of an itinerating Medical Officer, that is to say, by one who is in the position of the ordinary General Practitioner.

As a corollary to the substitution of General Practitioners for petty hospitals, I am strongly of opinion that the existing so-called travelling dispensaries should be put under the District Medical Officer of Health, as they are in the United Provinces, for example, to function as his flying squad in periods of epidemic stress. I also strongly advocate the employment of at least one sanitary inspector per district.

In conclusion, I may say that in putting forward these suggestions I have confined myself as far as possible to general principles. There are many points of detail which could be mentioned, but once general principles have been settled, the details will not present any great difficulty.

Oral Examination.

43,987. *The Chairman*: Lt.-Col. Forster, you are Director of Public Health in the Punjab?—Yes.

43,988. We have a note of your evidence. Would you like to add anything to that at this stage?—No.

43,989. I gather you are very anxious, if possible, to obtain direct access to the Minister?—Yes, and the Governor.

43,990. You say the position in this respect is worse now than it was nine years ago?—Yes.

43,991. That is, in pre-Reform days?—The Reforms have not affected the position; it steadily improved during the early years of the Reform period. It is only comparatively recently that this difficulty has occurred.

43,992. To what is the deterioration due?—I do not know. The position now is that the Director of Public Health does not see the files affecting his department, whereas before he did.

43,993. You are anxious that officers of the Indian Civil Service should be given a preliminary training at the commencement of their service in India in that side of their responsibilities in which you are interested. It is the case, is it not, that some training is now given to probationers?—All the training that I know of is an occasional lecture given by some exponent of public health in England. Some of them have written to me to ask for some elementary details that might usefully be assimilated.

43,994. How much time would be required to give these officers adequate instruction?—One month would be sufficient.

43,995. You are not satisfied with the way in which local authorities are discharging their duties in the matter of health?—That is so.

43,996. On page 512 of your note you suggest that after proper inquiry Government in the case of each district should fix for a term of years, either in the form of a percentage of total income or a definitely named sum, the budget provision which the District Board must make in respect of public health. Do you think that action of that sort would be in accord with the spirit of the constitution?—Certainly.

43,997. You do not regard these District Boards as entirely autonomous bodies within their own Province?—By no means.

43,998. Do you see any signs of an improved outlook in this respect on the part of members of District Boards?—Very little. I have noticed, however, that District Boards in districts which were particularly afflicted in the last plague epidemic have awakened to the fact that they will have to spend more than they did, and in a certain number of those cases they have agreed amongst themselves to a percentage on public health expenditure. How long that will last I cannot say.

43,999. Is there an absence of public interest in, and so of public demand for, health services from the District Boards?—Far from it. There is a most urgent demand in the Legislative Council.

44,000. Then how do you account for the fact that members of District Boards are disinclined to vote sums of money for health services?—In the Legislative Council the revenues which will be given for those purposes are general revenues; that is to say, no particular cost falls on the local body, and the enthusiasm in the Council is great. When it comes to the District Board the enthusiasm does not exist.

44,001. Is opinion in the district not reflected in the votes of the members of the District Boards?—No.

44,001a. Do you think opinion in the district is likely to be reflected in the votes of the electorate when the next District Board election comes

along?—That is, of course, the theoretical argument, but since the Reforms were introduced I have never found any important public work of that kind which has been made the basis of an electoral campaign.

44,002. You do not think that a Public Health Act for all India in the present state of things is a possibility?—As I proposed that that should be done in 1919, I cannot contradict my own suggestion; I asked in 1919 at the Conference of Sanitary Commissioners that it should be considered, but I am not prepared to say it is absolutely feasible; but my note does not deal with that point; what my note asks is that for the Province there should be a consolidated Act.

44,003. In this matter of the organisation of your service in the districts, and in particular the organisation as it touches this hospital problem with which you deal in the note, if you had your own way, would you close the hospitals as hospitals?—Let us be clear what we mean, first of all, by hospitals here; if, for instance, you start from Edinburgh to Newcastle, a distance of 122½ miles, you will leave behind you in Edinburgh one of the world-famous hospitals, but you will not come to another first-class hospital until you come to Newcastle. If you start from Lahore, you leave behind another famous hospital; when you have gone 35 miles distance you will get another first-class hospital; when you have gone another 45 miles distance you will get another; in fact, this Province is studded with hospitals on a grand scale; but the hospitals I am referring to are in the urban areas. Primarily, there is no objection to hospitals being there. When you go out of the urban areas into the districts, you come to what is known as the dispensary. Now, this is the thing against which I have railed in my note, because this dispensary is a petty hospital with a varying number of beds, and it is also supposed to fulfil all the functions of a rural practitioner in the rural areas; I should certainly and emphatically cut off all hospital work from those dispensaries.

44,004. In taking that view, how far are you founding yourself on your views of what machinery may be required to deal with epidemics and how far on your view as to what machinery may be required to deal with non-epidemic diseases, day-to-day casualties and minor ailments of the population?—I have not followed your question.

44,005. Do you take the view that you have just explained to us because you think that the plan you advocate is that best designed to deal with important epidemic diseases?—It is that which is best designed to deal with both.

44,006. Both for epidemic diseases and for the ordinary minor ailments and casualties of the population?—Yes.

44,007. I suppose under your system the officer would be to some extent peripatetic?—Certainly; he has an area.

44,008. To what extent is it possible for the individual who thinks he wants medical attention to find the medical officer—He has his headquarters.

44,009. Does he have definite attendance times at his headquarters?—Yes; he is in the same position as the country practitioner at home who is subsidised under the poor law; he has his headquarters; he must at certain intervals visit all parts of his area; but anybody who wants to see him can always get him at some time in the day.

44,010. What class of cases come into these hospital dispensaries, apart from epidemic disease cases: fractures and cases of that sort?—Epidemic disease cases you never see; if you look over their records you will see that the cases are generally of the most trivial nature: the entries which I have examined consist of statements such as the following:—Headache, cold, fever, contused wound, and so on.

44,011. How about fractures?—Some of them are taken, but I have seen very few fractures entered in the lists.

44,012. How about surgical cases?—Surgical cases go to the big hospitals.

44,013. Minor surgical cases are not treated as bed cases in the hospitals attached to dispensaries?—It depends; if they have got room, they will take in anything, because they must show at the end of the year that they have had so many bed patients, and a man with a cut finger may be supplied with a bed if it is necessary for statistical purposes.

44,014. Is public opinion at all settled on this issue?—Public opinion, as far as I have been able to gauge it, is very strong in my favour; in fact, I have been offered in one district a lakh of signatures to a petition to have this system which I have noted here introduced at once. I do not pretend to have visited all the areas or to have inquired from all of them, but in most of the areas the leading people are in entire agreement with me. I might add that we have recently had a conference by order of Government to consider this very question, the senior member of the conference being a very senior Commissioner of this Province, and that conference unanimously decided that this was the system which should be introduced.

44,015. I suppose the absence of good communications in this country to some extent vitiates any comparison between this country and Great Britain such as you made a moment or two ago?—To a certain extent, yes; but then it must be remembered that the transport of this country is naturally adapted to the communications. In Great Britain a man in the moorlands who suffers from a sudden and serious surgical emergency will *pro rata* suffer as much in his journey from that moorland to the hospital as a man in this country will in his journey from the *tehsil* to the hospital. I do not think, taking them as they stand relatively, there is very much difference.

44,016. I must say if I had a fractured arm I should prefer a spring ambulance to a bullock cart?—Possibly, but you may not have been carried in a *dhoolie*, and I have.

44,017. You have told us nothing about medical research; have you any views on that point which you would like to put before the Commission?—May I please understand what you mean? I am not meticulous, but I want to know. Medical research is a big question.

44,018. Quite, and I put it in its widest form to give you an opportunity of saying anything in that field that you may want to say?—As I am one of the old research workers of India, I could keep you all the morning on that. Speaking for my own Province, I may say that one of our great requirements, so far as the preventive side of medicine is concerned, is to have fuller development of the laboratory side of it, not only for research but for routine. Routine in itself becomes a research inasmuch as it provides the basal data. The very first thing that happened when the Reforms scheme was introduced was that this subject of public health was taken up with the greatest enthusiasm, and there was sanctioned for this Province a hygiene institute which would have given everything we require. Unfortunately, we had the period of financial stress which began in 1921, so that that scheme, which had been sanctioned and entered in the budget, was of necessity cancelled and held in abeyance. Since then, although we have been a prosperous Province for several years, I have not been successful in getting Government to re-accept that institute, and I would say that the laboratory side of public health in this Province is far from being in a satisfactory state.

44,019. How about facilities for bacteriological examination of specimens and so on?—We have provided facilities in the shape of officers, but we are dependent upon the courtesy of the Principal of the Medical College for

a building in which to carry it out. To a certain extent, we are able to do it, but what can we do when we have not got proper buildings, plant and equipment, which are necessary for such work? We do our best. The hygiene institute would fill up the whole of that blank.

44,020. Is there a Medical School in the Province?—Yes, we have a very great Medical College here, and we have in it one of the finest laboratories in India; and I say so proudly, because I designed it. I say so because much greater authorities than I am have looked at it and agreed that that is so. We have a magnificent laboratory here, but that is barely sufficient for the Medical College itself. If you will allow me to say so, there is yet another point, that in research and laboratory work in medicine you finally come to two great orientations: that which takes up medicine from the point of view of cure, and that which takes up medicine from the point of view of prevention. All research work orientates off to those two points. We have elaborate arrangements for the purely therapeutic side, but for the preventive side we have virtually nothing.

44,021. Are water-borne diseases prevalent in the Province?—No.

44,022. Is the rural drinking water supply satisfactory?—Taking the Province by and large, water supply is not the most urgent problem in the rural areas; there are areas in which it is of extreme urgency; for instance there are cases known in the Hoshiarpur district of actual death from thirst; that is sad, but it is true. There are other parts of the Province where the water supply is of very urgent importance; but, taking the Province by and large, the water supply is not the most urgent question; the most urgent question in the rural areas is drainage.

44,023. Does the population in the canal districts drink canal water?—They have two methods of dealing with canal water; one is that they dig wells in the vicinity of the canal, when in consequence they are assured of a high water table, and, even more, they are assured of sweet water. In many of the canal areas the water tends to be saline, and the nearer you can dig your well to the canal the better. Another method is that they run the canal into the wells and keep them covered for a certain time, and in that way reduce the salinity of the water. They do not depend upon the canal, because canals must be shut down for at least thirty days in the year to enable work to be done by the Irrigation Department, so that for thirty days they would be without water.

44,024. Is canal water potable?—Yes.

44,025. On this matter of drainage that you have mentioned, naturally the Commission has heard a good deal of evidence from the engineering and irrigation side, but from the health side you attach great importance to it?—The utmost importance.

44,026. In the meantime do you think the position is unsatisfactory?—No; it is the one thing we can be proud of; the arrangements for dealing with drainage in this Province are unique.

44,027. So that you are satisfied with existing conditions?—Quite.

44,028. Have you anything that you would like to say about the supply of quinine?—Yes; as I have noticed in this note, one of the first things in connection with the supply of quinine, that is to say, the administration of quinine to people suffering from malaria, is with regard to this rural medical practitioner; that is the first point. The second point, which is one which is urged a great deal by Members of the Council at times, is that in giving quinine to the districts I think Government should be more generous than it is in the matter of price. Those are my two points.

44,029. You probably have studied the problem of supply?—I have written a note on the subject which the Government of India considered unfavourably.

44,030. What was the burden of your song?—The burden of my song was that the Government was placing this country in the hands of the Java ring.

44,031. *Sir Henry Lawrence*: When was this note written?—I think towards the end of 1920.

44,032. And what effect has it had?—None that I know of.

44,033. *The Chairman*: Perhaps you might let us have a copy?—I should have to take the permission of the local Government.

44,034. Would you mind doing that for us?—With pleasure.

44,035. Now, since quinine is required in all the Provinces while it is a drug which can only be produced in a few, is it your view that the production of quinine should be in the hands of the Government of India?—Yes.

44,036. Meantime, if I remember rightly from your note in the provincial memorandum, you give it as your view that there is not sufficient quinine available, quite apart from the matter of price, adequately to deal with the situation?—Although I have not actually written that note, still I agree with that statement.

44,037. Are you satisfied with the present arrangements for educating children in principles of health?—I can say this, that the Education Department is in constant and close communication with the Public Health Department to arrange that children shall receive in public health, instruction which the Public Health Department would like to give them.

44,038. Have you any system of instruction in hygiene in your jails for the prisoners?—None that I know of, except of course the rules of the jail which are in themselves an education in hygiene.

44,039. Do you think it might be worth while to have some system of instruction apart from the example?—I hardly think so; the people who go out of the jail have learned the principles of hygiene in a way in which they can never forget; it has simply become automatic with them. I might point out that having conducted two jail inquiries, my experience is that it is possible to find people in the jails of India doing a term of about 96 years.

44,040. Still I imagine that a few have shorter sentences?—Some.

44,041. *Sir Henry Lawrence*: Do you consider that maximum of 96 years too high?—I consider such sentences are inhuman.

44,042. *Sir Ganga Ram*: Have you ever been a Jail Superintendent yourself?—Yes.

44,043. *The Chairman*: The Education Department is conducting a system of adult education. Do you know whether health forms any part of that scheme?—Yes.

44,044. You are in touch with the Education Department in that matter?—In the closest touch; we jointly arrange to stock libraries for these adult schools.

44,045. A word or two about the habits of the people as they affect health. I suppose in the villages any form of latrine is almost unknown?—That is true; I might add that in most villages it would be undesirable.

44,046. Do you think that the habit of relieving nature in the fields is preferable?—Yes, it is preferable to what is generally found to be a stinking nuisance.

44,047. Is hookworm prevalent in the Province?—No.

44,048. Does it exist?—Yes.

44,049. In the case of hookworm, has it been established that nightsoil deposited in the open field and in the full glare of the sun is rendered sterile?—I do not know if that has yet been definitely accepted or not.

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44,050. That is an important consideration in discussing the question as to whether the habit to which we have referred is the ideal one, is it not?—Granted; but there are certain modifying characters which have to be considered in relation to that. Hookworm is not a disease of any consequence in the Punjab. You must have a moist soil for its development, and in giving my opinion I am only referring to the Punjab.

44,051. *Sir Ganga Ram*: Not to the Kangra District?—No, it is not prevalent there; the only places where it is prevalent is the mental asylums in this Province.

44,052. *The Chairman*: How do you account for that?—In the asylums there are people with filthy habits and that facilitates the spread of the infection.

44,053. It looks as though you have a proportion of carriers?—There are some unquestionably.

44054. Cholera is an epidemic from which you suffer in this Province?—Occasionally; cholera is the one epidemic disease that does not do things on a grand scale in the Punjab. It is rare for cholera to affect our total mortality by a whole figure; generally it cannot get beyond a decimal point.

44,055. Is that due to climatic conditions, or to your water supply, or what?—I maintain that it is due primarily to the conditions under which we live, that is to say, in the Punjab the sources of rural water are multiple inasmuch as they consist of wells, and it is not easy to contaminate them unless it is done deliberately or from ignorance. Secondly, it is apparently also climatic; as to what the actual climatic factors are, there is as yet no definite agreement, and I do not think that that is a subject which I would care to discuss because it is so much in the melting-pot.

44,056. To what extent do you associate malaria with irrigation?—I have prepared a note on that point and I will, if I may, read the final conclusions arrived at. They are, *firstly*, canal irrigation is not a factor of any importance in determining the incidence or severity of endemic malaria. (Of course you will understand that I am speaking purely with regard to our own Province.) *Secondly*, it may be asserted with equal confidence that open field irrigation has not been responsible for any appreciable general increase in endemic malaria; *thirdly*, as a general statement it may safely be concluded that the salubrity, so far as malaria is concerned, of irrigated tracts compares favourably with the non-irrigated area; *fourthly*, as a partial exception to the general rule, it is certain that wherever canal irrigation gives rise to waterlogging, a vicious circle is set up in which endemic malaria leads to bad health, bad health to economic stress, and economic stress to further privation and more sickness, and, finally, as the result of a high death-rate and a low birth-rate, emigration and depopulation of the affected tract. This examination of the problem permits of the conclusion that an increase of malaria is not a necessary concomitant of canal irrigation and that canal irrigation is only prejudicial to health whenever it is wrongfully applied or imperfectly carried out. There is ample justification for the statement that canal irrigation has proved an unmixed blessing (save in a few areas) and that, assuming waterlogging is not allowed to arise, canal irrigation is calculated not only to increase the wealth and prosperity of the Punjab but also to promote the health and well-being of the inhabitants. That is our position on which we are prepared to stand.

44,057. If you had your way, would you increase the numbers of your officers in the Province to an important degree?—I want an increase, but if you consider it in relation to other cadres I would not call it an extraordinary increase. I want a Medical Officer of Health for each district.

44,058. How many extra officers does that mean?—Taking the total of the districts, it would come to 28 and that number is already sanctioned. Then, I would want for each of them an Assistant; the rest is minor establishment. I want a Sanitary Inspector for every district; if possible for every *tehsil*.

44,059. What grade of Sanitary Inspector would you require?—We want Sanitary Inspectors of the first and second grades.

44,060. What training should they have?—The same training as is given to the Sanitary Inspectors in England; here they have to obtain a certificate which is exactly the same as that given by the Royal Sanitary Institute in Great Britain.

44,061. *Sir Henry Lawrence*: And the salary?—The salary begins at Rs.50 and goes up to Rs.90, and the next grade, which is the Chief Sanitary Inspector, begins at Rs.100 and goes up, I think, to Rs.150.

44,062. *The Chairman*: Can you find men qualified for these posts at present?—No, that would have to be done gradually.

44,063. Your figure of 28 which you quoted consists of qualified men, does it?—Yes.

44,064. How about their training? Can you provide for that, and can you find the men?—We take on men who have had the qualification of D.P.H. which is recognised by the General Medical Council of Great Britain.

44,065. Is there a sufficient supply of M.B.s?—Yes; they are suffering from acute unemployment.

44,066. *Mr. Calvert*: You are leaving out Simla in your calculations?—Yes; we always leave out that district.

44,067. *The Chairman*: Have you commenced recruiting for the new Superior Provincial Service?—We have no new Service.

44,068. Are you not to have a new Superior Service according to the recommendations of the Lee Commission?—I have not heard of it; it may be on the Medical side.

44,069. Just a question or two about the nutrition of the population in the Punjab: What has been the general effect of irrigation and the consequent enhancement in the yield of the soil upon the agriculture of the Province?—Most excellent; in fact at the Punjab Engineering Conference some few years ago I pointed out that whatever increase of population had taken place in this Province had occurred mainly in the irrigated districts.

44,070. Has the diet of the people changed in any important respects?—Not that I know of; except that the milk supply and of course the product of milk called *ghi* which in this country is of vital importance, has undergone great deterioration, in this sense that they cannot get milk and consequently they cannot get the *ghi*.

44,071. In pre-irrigation days was the population very largely pastoral?—I am not in a position to say.

44,072. How do you account for this deterioration?—It is very difficult to say, but, looking at it as an ordinary human being, I think the people have discovered that growing crops pays better than growing milk.

44,073. Is the population largely a wheat-eating population?—Yes, practically entirely.

44,074. And to that extent, so far as adults are concerned, they are in some measure protected against the incidence of those deficiency diseases which are likely to follow an under-consumption of milk and milk products; is that so?—No; they are saved from the deficiency diseases associated

with rice; on the other hand, even wheat cannot save them from the deficiency of the vitamin which is supplied mainly by *ghi*.

44,075. In any case, your child population requires milk and milk products whatever the adult diet may be?—Yes; but the adult requires those just as much as the child.

44,076. Do you think that the absence of dairy products among the population is seriously affecting its health and efficiency?—I have no statistical data of any type or kind to produce in that respect; I can only tell you that taking the standard diet as worked out in this Province the lack of the vitamin provided by *ghi* is such that the person must always be regarded to be on the verge of what we call the scorbutic condition. I have seen it myself in the early days in the Army; one of our great troubles always was, in those days, this question of scurvy, and it takes very little to turn in the wrong direction.

44,077. To what extent is it practicably possible to substitute other foods providing the essential vitamin?—We have never worked it out here.

44,078. *Sir Henry Lawrence*: You say that scurvy was due to the lack of milk or *ghi*?—To the lack of that particular vitamin supplied to the Punjab population by milk and its products, the chief product being *ghi*.

44,079. *Mr. Calvert*: Do you say that there is scarcity of milk products in the Punjab?—Yes.

44,080. Is it not the fact that there is so much of milk products that people actually wash their hands in it?—I have never heard of it.

44,081. *Sir Ganga Ram*: Is not scurvy due to the want of vegetable diet?—That is another source of vitamin. *Ghi* is the best method and has been from time immemorial in this Province the method of obtaining that vitamin.

44,082. *The Chairman*: Are you quite sure that it is the absence of milk and milk products and not either the selling of the milk produce to persons other than the cultivator or the disposal of the milk by some other means that is doing the damage?—I am not prepared to give any definite statement on that point.

44,083. *Sir Henry Lawrence*: Would vegetable *ghi* supply this vitamin in the same way as the milk *ghi*?—No; that is absolutely devoid of it.

44,084. *Mr. Barron*: Artificial *ghi* made from oils?—It is absolutely devoid of it.

44,085. *The Chairman*: Has any propaganda been directed to encouraging the consumption of milk and milk products among the population?—I do not think any propaganda is needed. What propaganda has taken place and is going on largely is the propaganda against the product to which Mr. Barron referred, the artificial *ghi*. They have obtained from us the scientific information as to what the constitution of these *ghis* is and what their effects are likely to be, and a very strong propaganda against them is conducted; so that in an indirect way that is a propaganda for the use of the milk *ghi*.

44,086. Have you any indications of the result of that propaganda?—Yes, several prosecutions.

44,087. You have been prosecuted?—No; the health authorities have succeeded in prosecuting the people for selling this imported vegetable product as pure Indian *ghi*.

44,088. *Sir Henry Lawrence*: Were those prosecutions successful?—I cannot absolutely say, but I assume they were; the case was perfectly clear, as we have Government standards.

44,089. *Sir James MacKenna*: In answer to the Chairman you expressed the opinion, arrived at after consideration of the question, that the malarial position is not much affected by irrigation in the Punjab?—I have stated that except where irrigation is wrongly applied, no; irrigation is beneficial.

44,090. What about irrigation works under construction? Is there an increase of malaria in those areas where canal works are being constructed?—We have no definite figures, but I can answer you this, that if you have to have a canal or any other big work under construction in this Province, and if there happens to come a malaria epidemic, the workmen will suffer badly from it; but so far as endemic malaria is concerned, our answer is "No." Our works have never been affected.

44,091. You told us that you submitted a note on the quinine position to the Government of India?—To the Punjab Government, which referred it to the Government of India.

44,092. Do you not think that perhaps the attention of the Government of India must have been directed to this note, as they have been extending their quinine operations in Burma and the Anamalais?—I myself do not know.

44,093. You will not claim credit for having suggested this extension?—No. I was merely voicing the opinion of many.

44,094. Of course, you do know that they are extending their operations?—Yes; it was on this question of expansion that the note was written.

44,095. *Professor Gangulee*: Do you think, under the existing conditions in India, decentralisation of public health control is in any way desirable or advantageous?—I am afraid I do not follow you. Under the Government of India Act, at present public health is a decentralised subject; it is absolutely under the control of the Local Government.

44,096. I ask: Is decentralisation desirable?—I can only say that in this Province it has had the most happy results.

44,097. You have a Rural Sanitary Board in this Province. What is its function?—The Rural Sanitary Board deals with drainage problems in the rural areas; that is to say, it undertakes the opening up of all blocked drainages and, in so far as it does not clash with the Irrigation Department, the lowering of the water table.

44,098. Who are the members of that Board? Are the District Boards represented there?—The members consist of technical officials like myself and members nominated by the Honourable Minister who deals with all public health problems.

44,099. They have a special fund allotted to them?—They are in a much happier position. They have no fund. What happens is this: Where the Public Health Department or anybody else points out that a drainage problem exists in the rural areas, the technical staff of the Rural Sanitary Board surveys the area; they themselves prepare the project, and it may be a project dealing with a drain 150 miles long. They prepare that project, which is scrutinised by the technical people like myself. Having been approved, it goes before the Board. If the Board approves of it, it goes to Government, and Government give the money. So that if you look into the budget you will find for this year the amount entered for the Rural Sanitary Board on account of works in progress and new works is 15½ lakhs.

44,100. So Government allot funds when the definite schemes are prepared?—True.

44,101. Each scheme is taken on its merits?—Yes.

44,102. On page 512 you refer to schemes for a permanent preventive organisation for the rural circles, and you say that such schemes are ad-

versely criticised. What are the special difficulties? What is the basis of the adverse criticism?—The basis of the adverse criticism is that I, as Director of Public Health, ask the Government to pay in their entirety for schemes to which the local bodies should contribute. These schemes, as I put them up, are based on the principle of the whole cost being paid by the Local Government, and the Local Government sends them back and says, "Why should we pay the whole cost? You must show how much the local authorities will pay." The local bodies will not make such an effort. I have explained it here is this paragraph. We are in a vicious circle.

44,103. Your suggestion is that a special rate for public health should be imposed?—That it could be imposed.

44,104. Are the District Boards willing to have it?—I should think the District Boards will oppose anything which leads to an increase of rates.

44,105. While we are on this subject, you refer in the provincial memorandum to another scheme, what is known as the reorganisation scheme? What is the position with regard to that?—I have stated in the memorandum what the position is.

44,106. On pages 231-232 of the memorandum* you simply say: "The Government do not accept the suggestion that this expansion should be effected at the expense of the 'curative organisation.'" The matter rests there, does it?—I am afraid it does.

44,107. You suggest that the officers of the Indian Civil Service should have some preliminary training in public health administration. Where would you like to give them this training?—I think I have made it clear in the note.

44,108. It is not stated where you would train these men, in England or in India?—Here in India.

44,109. And for how long?—One month would be sufficient.

44,110. In your public health budget, how much money do you allot to the District Boards? Do you allow anything at all in the Provincial budget?—What happens in regard to allotments is this: We have three headings in our budget; one is the heading known as "expenses in connection with epidemic diseases," for that the Government gives us a lump sum grant. As I have stated here, when epidemics break out in districts we supplement their budget provision from that; so that there is no definite sum for any one district, but there is a lump sum for the whole Province which can be increased by supplementary estimates by Government; that is the first heading. Then there is another heading, grants in connection with public health purposes. This deals with purely constructive works which are carried out for rural areas by the Urban Sanitary Board. In the third heading we give to each district the actual pay of their Health Officer and his travelling allowance, etc. Those are the three headings.

44,111. With regard to this Public Health Act, would you include social hygiene legislation?—I would include all those things that are included in the English Act of 1875, and, as adoptive, those which are in the last edition of the English Public Health Act, which I think is dated 1907.

44,112. For instance, things like the compulsory notification of venereal disease?—I do not think that is included in the Acts I mention.

44,113. That has recently been adopted in New Zealand and other countries. You would not include that?—No. I would confine myself strictly to what is included in the English legislation referred to.

44,114. This consolidated Public Health Act would be confined to the Punjab?—It would be a consolidated Act for the Punjab only.

44,115. Do you think the rate of infant mortality is increasing in this Province?—It goes up and down, so that you cannot say with accuracy

* Memorandum prepared by the Punjab Government for the Commission (not reprinted).

whether it is or is not increasing. On the whole, taking the last five years with the previous fifteen, it has slightly decreased. It remains approximately round about 200.

44,116. That is both in urban and rural areas?—For the whole Province. In urban areas it may go up to over 400.

44,117. You have made the very interesting suggestion that the village schoolmaster should be your reporter. Will his work be honorary, or would you pay him?—We would pay him.

44,118. Will you have to give him some training also?—We already have, in conjunction with the Education Department, an excellent system of giving schoolmasters elementary training in these matters.

44,119. You would give him elementary training and increased salary?—We would treat him in the same way as the Post Office does; they pay him to run the post office.

44,120. With regard to the proposal of subsidising private practitioners to live in rural areas, is that in operation here?—I am sorry to say it is not.

44,121. They are trying it in Madras and other Provinces, and it has not been altogether successful?—With regard to Madras, what is meant by "trying"?

44,122. They give Rs.400 a year as a subsidy provided he lives in a village area, but we are told it has not proved attractive? You have not tried that system in the Punjab?—No.

44,123. *Mr. Calvert*: Is it not being tried?—The whole suggestion has been thrown out by the system of petty hospitals.

44,124. *Professor Gangulee*: A general practitioner, if he is to be of real value in rural areas, ought to have some special qualification in sanitary matters?—Every graduate of an Indian University goes through what is known as the M.B. course in public health, and that should be sufficient.

44,125. In village areas, as you know, there are many quack doctors. Is there any Act to control them?—No, neither here nor anywhere in the world.

44,126. One or two attempts have been made elsewhere?—The only regulation you can attempt is to prevent him assuming that he is qualified by law. Provided he does not assume that, he can do what he likes, and no legal authority I know of will undertake to draft an Act to prevent him.

44,127. The Medical Practitioners Act does not affect him?—No. Anyone can practice medicine or surgery so long as he does not attempt to persuade people he is qualified according to law.

44,128. Is there any regulation with regard to drugs and patent medicines which are sold in the rural areas?—Only those affected by Imperial order, such as opium and cocaine.

44,129. So any patent medicine can be sold in village areas with impunity without infringing the law?—Yes.

44,130. *Mr. Calvert*: On page 222 of the Government memorandum* you are responsible for a statement of the population of the Punjab. Are you not referring there to the Punjab plus the Indian States and Delhi?—I cannot tell you offhand. The actual tables are given in the Census Report.

44,131. The population of the purely British part is about 20,000,000. Your number of 45,000 for villages includes the Indian States?—Yes, that is for the Province as a whole.

* Memorandum prepared by the Punjab Government for the Commission (not printed)

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44,132. We went to see Colonel McCarrison's work at Coonoor, and he showed us there that so far as rats were concerned the Punjab diets produced the finest and healthiest rats in India. His conclusion was that Punjab diets made for the finest creatures; yet the Punjab mortality is the highest in India. How does that fit in with the idea of diet having some relation to health?—They do not die of diseases caused by diet, but of these terrible epidemics such as plague. Plague, as I think I told you, in 24 years killed 3,000,000 people. Plague is unaffected by diet; you or I stand no better chance than the ordinary zamindar. The same is the case with malaria, small-pox and relapsing fever.

44,133. To what extent do you think rural labour in this Province is rendered less efficient by ill-health?—I cannot say. All I can say is that in those areas where there is endemic malaria the standard of work you can get is extraordinarily poor; engineers will tell you that. I can also as a public health officer point out that when there is an epidemic in those areas their case mortality is very much higher than anywhere else in the Province. They have a general lowered tone. You can take it that in districts where you have waterlogging and blocking of drains, which results in endemic malaria, you get a lower standard of health, which is reflected in inability to work and to resist disease.

44,134. Normally the rural population of the Punjab is free from deficiency diseases?—Yes.

44,135. We have also had evidence given before us that it is perfectly possible to stamp out malaria even in a Province like Bengal. Do you think it is humanly possible?—You must not ask me to criticise statements in regard to Bengal! Confine me to the Punjab.

44,136. Do you think it could be stamped out in the Punjab, within practical limits, that is?—I would not like to give a definite opinion.

44,137. You would not like to take it on?—No.

44,138. I gather you have been making some very interesting inquiries into the connection between rice cultivation and malaria?—We have done a little. I would not say we have done very much here, because, as you know, rice cultivation in the Punjab is confined to certain areas. We have established a very definite correlation between rice cultivation and endemic malaria, but I would not pretend we have done so much work on that subject as has been done in some other Provinces where rice is grown to a much larger extent, such as Bengal. Our work is small compared to anything they have done.

44,139. Would your conclusions apply to Madras and Bengal?—I would not go the length of saying that.

44,140. You have told the Chairman of your work in co-operation with the Education Department?—Yes.

44,141. I understand school teachers are now undergoing lessons in hygiene?—Yes.

44,142. Have you also worked in conjunction with the Co-operative Department?—I always regard the Co-operative Department as working in direct connection with the Education Department. We are all three united in what is now known as the Rural Community Board.

44,143. Other Provinces have been rather surprised at the suggestion that there could be any connection at all between these three departments? —We regard ourselves as inseparable. In fact, public health wants to get on any back that will carry it along.

44,144. I have seen Mr. Brayne's clean villages. Do you think they will lead to much improvement in public health?—If the system is consistently maintained, it will.

steadily in progress; the total is somewhere in the budget but each year so many more are put in.

44,173. So that it is quite possible to offer the Sub-Assistant Surgeons Rs.100 or more a month and to have this sort of scheme?—I have said that the minimum offer so far is Rs.75; I would like to raise it to Rs.100. I will not be absolutely definite until I have had an opportunity of considering the figures because it will have to be paid in two ways: part from Government and part from the local authorities; but I am inclined to agree with you.

44,174. *Mr. Roberts*: With regard to drainage, can you give us a figure as to what depth you wish to keep the water table?—In the old days of the Drainage Board this became a very hot question; I am not sure if you yourself were not one of the disputants.

44,175. Yes?—We finally came to the conclusion that when we were going to give a standard for the water table we would give two different standards: one which the Public Health people required and one which the Agriculture people required. At that time I maintained stoutly, and I still maintain, that anything above ten feet is undesirable from the Public Health point of view. Agriculture had a different point of view.

44,176. From your point of view the reclamation of these waterlogged areas by shallow drains does not quite achieve the object: it will not lower the table more than three or four feet?—I must not commit myself to a technical statement of that kind; I do not know.

44,177. The drains are not going to be deeper than five feet at the most? —Yes; at the tail end of the drain that may be your water level, but owing to the fall of the land it may have given you a much greater lowering higher up.

44,178. But in the neighbourhood of the drains themselves it cannot be much less?—It will not be any less than what the drain is, true.

44,179. With regard to the spread of dispensaries, is your view coloured to some extent by the fact that these are not under your control?—Not at all; in my scheme they would not be under my control; they would be under the control of the District Board.

44,180. You think that the spreading of medical practitioners is a sounder method generally than the spreading of dispensaries?—And it is a method which has been accepted by the rest of the civilised world.

44,181. Turning to the Veterinary Department, would you be prepared to risk an opinion on that also?—No.

44,182. With regard to these *Tehsil* Boards, you say you would not go below a *tehsil*?—Is it your experience that smaller circles are not efficient?— Of course my experience is naturally purely English in this matter and my experience is that they do not fulfil any useful function.

44,183. *Sir Henry Lawrence*: Will you tell us a little more about this scheme of subsidised medical assistance? When was it promulgated by Government? When was it accepted?—It was put up by the Sanitary Board; I put it up through them in 1919. It went to Government direct at that time. As it passed into the hands of the Medical Department I do not know how long it was under consideration; all I do know is that when I returned from leave last year I found that the scheme had eventually taken form in that particular way which I have described; that is to say, instead of a medical practitioner, which was the basis of the whole scheme, a petty hospital had been substituted and that scheme is being extended each year; so many of these are put into the budget each year. I speak subject to correction, but we can easily get the figures; I think at present 130 have been so constructed, and there will go into the budget this year 30 or 40 more; each year it will go on.

44,184. In this statement it is said that the number of dispensaries is 483, and there will be another 375?—That is the scheme, yes.

44,185. Your opinion is that too much money is being put into bricks and mortar and not enough into men?—Yes, coupled with the fact that by putting your money into bricks and mortar you tie the men to the bricks and mortar.

44,186. You have been pressing for the recognition of the principle that prevention is better than cure for a good many years?—Yes.

44,187. And you do not think that view is yet fully accepted?—No.

44,188. How long have you been in charge of the Department?—Since August, 1918.

44,189. I see that in the last seven years you have succeeded in increasing your budget expenditure threefold from 10 lakhs to over 30 lakhs?—But if you look into the details you will find that there is something rather peculiar about that; you will find that one method of swelling it is to transfer from the Public Works Department the whole cost of the Sanitary Engineering Department to my budget; if you look in the last year's budget you will find Rs.12,80,000 in my budget from the Irrigation Department. The Public Health budget has been a convenient little hole into which things are shuttlecocked from time to time, so that the actual figures you read there are no true guide at all as to progress or advance in Public Health.

44,190. In the meantime the medical budget has gone up from 31 lakhs to 46 lakhs?—Yes.

44,191. Is the present figure of 31 lakhs for Public Health approximately correct for this last year?—Nowhere near; our actual budget for this year, which is supposed to be 10 lakhs in excess of last year, is 22 lakhs.

44,192. These statistics are capable of different interpretations?—Yes, you can make nothing from those budget figures.

44,193. At any rate you are anxious that very much larger provision should be made for Public Health?—Yes.

44,194. And that this doctrine that you have been advocating for many years, that prevention is better than cure, should be definitely accepted? —Yes.

44,195. You make a point in your statement here with regard to the rates which District Local Boards levy, which are limited to a maximum of one-eighth of the assessment. Would you like to have that maximum raised? Would you like to have it permissible by law that District Local Boards should levy larger rates or would you like your Public Health rates separately assessed? What is your view?—You raise a very difficult question in local finance. As I have explained, and as you know, the principle of unlimited rating is not accepted; we have got a maximum rate laid down. If the principle of unlimited rating were accepted, the position would be quite simple: you could summarily call upon the District authority to devise, to execute, certain schemes with regard to Public Health and, whatever the cost might be, it would be imposed in the form of a rate. But in the present system you cannot do it owing to the fact that these District Boards have already got constant recurring expenditure on schemes which do not concern Public Health and which virtually use up all their resources. As matters stand, I would much rather see Public Health protected by a special rate.

44,196. Has any draft been prepared of the kind of legislation that you advocate?—No; whenever that has been attempted it has been turned down, so that we have not bothered ourselves about the draft.

44,197. Even the suggestion that there should be an Imperial Public Health Act has not been accepted?—The Government of India in their circular letter said that we were mistaken in assuming that was required. They said what was required was that in every Province in India every legal enactment which concerned public health should be bound in one volume. That was the Government of India's method of consolidation.

44,198. When was that?—The proposal was made in May, 1919, and this was circulated throughout the whole of India with the remarks of the Government of India on it.

44,199. Can you let us have a copy of that letter?—I will do my very best to get you one, as I have not got it in my office.

44,200. Was there some discussion recently at a meeting of Public Health Officers in Calcutta regarding the use of quinine? One Public Health Officer told us that the distribution of quinine was not fruitful, and that measures of drainage and so forth should be proceeded with rather than money should be spent on the distribution of quinine?—That was a purely Bengal Conference, and if I may say so, ancient history so far as its conclusions are concerned.

44,201. It was held last December?—That is purely a Bengal Conference; it was not a general one. I attended the general one, which was a different one altogether.

44,202. You do not accept the view that the distribution of prophylactic quinine is a measure of doubtful efficacy?—I have been opposed to that from the very first. I was deputed some years ago to advise the Bengal Government, and I wrote a report in which I pointed out to them that the distribution of prophylactic quinine is a thing which will slowly and gradually, as the people realise the malaria problem, be given up.

44,203. I am afraid I misunderstood your remarks: I thought you were advocating the distribution of quinine at a lower price?—That is for treatment.

44,204. This other thing is for prevention?—Yes; and I have opposed it since the day I entered into scientific medicine.

44,205. One measure in force in certain areas is the distribution of quinine prophylactically to school children?—Yes, so far as prophylaxis is concerned I disapprove; but the distribution of quinine for the treatment of actually affected school children is quite another story. I am arranging with the Education Department to treat children whom we know to be actually suffering from malaria.

44,206. I was interested in your statement that certain jail sentences amounted to 96 years in all. In your investigations did you see any indication that the persons so treated belong more generally to the agricultural classes than to the urban?—I could not answer that question.

44,207. Did you make enquiries to ascertain for what offences these long sentences of 96 years had been inflicted? Were they for cattle-lifting and things like that?—One was the case of an old lady, in fact it is the very first case of the kind in the Lahore Female Jail, and her crime was, I think, that she made several unsuccessful attempts to drown one of her grandchildren, and her final attempt proved successful. Another was the case of a man who was given a series of sentences for, I think, dacoity; that, I presume, will be rural. I am afraid I cannot give you any definite proportion as between urban and rural criminals in this matter.

44,208. Where these are agriculturists, would you like to have them released more freely in order to let them go and preach hygiene in the villages?—I am not prepared to say that.

44,209. But when you say these are extreme sentences you presumably have some desire to secure some such remedy for this?—The remedy begins with the Courts who impose such sentences.

44,210. *Mr. Barron*: Is there not a limit attached to the sentence whereby a man is released after having served for so many years?—Theoretically, but not practically, as far as I could judge.

44,211. *Sir Henry Lawrence*: You are advocating the same thing that I have been advocating for a great many years with very little success?—The same is the case with me.

44,212. Can you tell us what the relation is between malaria and sterility?—I cannot give you definite figures just now, but I can obtain them for you. It is an accepted fact, however, that malaria and low fertility go together.

44,213. Are you acquainted with the Karnal District, where there were great complaints of sterility about twenty years ago; those complaints have lessened now?—Very slightly.

44,214. We were told that there has been a great improvement in the drainage of that district?—The improvement is in progress; the area is so great and the blockage is so extensive that it will take years before any tangible results can be obtained.

44,215. You speak of the inadvisability of having latrines for villages. Where would you draw the line between the town requirements and village requirements?—We have in the Punjab villages with a population of 8,000 inhabitants, which is an obvious absurdity.

44,216. What is an absurdity?—Villages with such a large population as 8,000 are bigger than many towns, and yet they are called villages simply because they happen to be classed as *villages*.

44,217. And, therefore, they have no latrines?—No arrangements whatever of any type or kind, although the population is 8,000, which is more than that of many towns where there are latrines. I maintain that one of our duties should be to lay down a definition of a village on the population basis.

44,218. Where would you draw the line?—At 2,500 or 3,000.

44,219. Below that it is better that the villages should go without latrines, that the villagers should go into the fields; and above that figure the villagers should be provided with a conservancy system?—Yes.

44,220. *Sir Ganga Ram*: Do you know that the fields in which the people answer the call of nature grow the best vegetables?—I am quite prepared to believe it.

44,221. You just now spoke about the safeguard against scurvy. Do you know that such fields which are round about the villages in our rural areas are as much as 150 per cent. more valuable than the others?—Yes, I should say that they grow the best onions in India.

44,222. Your department is more or less advisory inasmuch as on the occurrence of an epidemic you have got to apply to the Medical Department?—No; we carry out these preventive measures ourselves and we certainly possess executive functions.

44,223. The Agricultural Department are destroying rats. May I know if the cost of that is borne on your budget?—No; their rats are not the same as our rats. The agricultural rat does not carry plague, it is a different species altogether.

44,224. You say that drainage is more important than the rural water supply?—On the whole I consider it is the more important problem of the two. But you are apparently referring to the drainage of the village, whereas I was referring to the drainage of the whole rural tract.

44,225. Did you visit my village Gangapur?—No; you have often promised to take me there, but you have not done so yet.

44,226. The Commission will be going there, and I should like to take this opportunity of inviting you as well. I think I can boast of having a perfect rural water supply system in my village, and there have been absolutely no cases of cholera there during the last 27 years?—I quite believe it.

44,227. Do you not consider that wheat-eating people can resist disease more than rice-eating people?—When you come to the question of diseases you must naturally find out the ordinary diseases from which the people die. But I should think that the Punjabi is a much stouter and sturdier fellow than anybody else in India; I should say that he is a credit to wheat; he suggests that wheat is a better diet than rice.

44,228. From the evidence which we have had before us we have gathered that many people are of the opinion that wheat has a peculiarity of resisting many diseases?—Yes.

44,229. In Madras one Health Officer gave it as his opinion that the best function of the Health Department would be to obtain birth control?—I have no doubt that he could support his statement.

44,230. And this system of giving a subsidy is really in vogue now in the Madras Presidency and they have sent a scheme to the Punjab Government which is under consideration; they do not seem to find any difficulty in finding good practitioners on Rs.300.

Now then, do you not think that these borrow pits along the railway lines are a nuisance in that they contain a lot of stagnant water which gives rise to malaria?—Opinion on that point is still divided. It must be accepted in general, however, that stagnant water is favourable to malaria; on the other hand water in the Punjab which is permanent in its nature such as village ponds can very rarely be associated with a noteworthy degree of malaria. The trouble about borrow pits is that they are not always full; if they were always filled with water I would not worry about them.

44,231. Do you think that these borrow pits are not likely to create malarial diseases?—I might put it this way by saying that any excavation which of itself leads to a temporary water accumulation is dangerous.

44,232. *Sir Thomas Middleton*: Mr. Calvert has already informed you that we have learned that the diet of the Punjab peasant is the best diet in the Indian Provinces. Ever since I came out to India I have been familiar with the words "Wait until you reach the Punjab." One was naturally prepared for records in the Punjab, but I was certainly not prepared to read that the general result is that the Punjab peasant contributes his quota to the highest provincial mortality in India?—Yes, we are first in everything.

44,233. The Punjabi is consistently first even in death?—Yes.

44,234. I have been looking into your figures to see how this particular record has been secured, and it seems to me that it is a doubtful claim. You have had, in the ten-year period which has just closed, two years in which there was a high mortality from plague; 11 per thousand in 1915, 12 per thousand in 1924. You also experienced the full effect of the influenza epidemic which swept the country in 1918 and in influenza deaths the Punjab nearly established a record. Is it likely that the next ten-year period you will be able to claim for the Punjab peasant a record in mortality?—I do not know what will happen to the Punjab peasant; I think you have been looking through those ten-year reports, but if you just look through the graph of the general mortality you will see that epidemics show themselves as a series of Himalayan peaks.

44,235. You have had three epidemics in the last ten years?—We have had more, because your deduction is confined only to the figures to which you have had access.

44,236. Do you or do you not agree that the statistical figures misrepresent the general health of the Punjab peasant?—I do not quite understand what that question means.

44,237. I mean as compared with the health of the peasants in the other Provinces?—I can put it to you in the words of the Punjabi peasant himself. He says: "We do not die of the diseases which kill people in hospitals but of the diseases that come and slaughter us," alluding thereby to plague and so on, and that is true.

44,238. Would you not agree that as bearing on the efficiency of the working population the most serious type of disease is a wasting disease?—By no means; it depends on what you are doing. If you are constructing a hydro-electric project you would sooner have a man with a slow wasting disease, rather than an epidemic of plague.

44,239. I was not thinking of hydro-electric projects but of the tillage of land?—The only difference that I can see is this, when you get a thing like plague you may find difficulty in getting the land tilled at all, because plague is a disease which attacks the adults; it spares the extremes of life.

44,240. You have stated that water-logging set up a vicious circle and I think you emphasised the effect of economic stress?—I can give you the actual wording: "A vicious circle is set up in which endemic malaria leads to bad health, bad health to economic stress and economic stress to further privation and more sickness, and finally, as the result of a high death rate and a low birth rate, emigration and de-population of the affected tract."

44,241. The two processes work together? There is the economic stress on the one side and there is additional breeding of the malaria-carrying mosquito. These two factors work together?—Yes, naturally.

44,242. Let us take the case of Lahore Cantonment. Does the economic stress influence malaria in that particular case?—Being a Cantonment, it does not come within my province; I disclaim all knowledge of it.

44,243. You say the reduction in the consumption of *ghi* would affect the health through a reduction in the available amount of vitamin C?—Yes, vitamin C.

44,244. It is not a comparatively easy thing to provide substitutes for vitamin C?—We have not found it easy.

44,245. In practice you have not?—No.

44,246. Do you not get it from your fruits and green vegetables?—Yes, we do; we get it from both.

44,247. Is it that you do not get anything like the concentration in fruits or green vegetables that you do in *ghi*?—As I say, we have not found it easy because we do not get the people to grow them nor are some people in a position to afford them.

44,248. Have you found an increase in scorbutic disease which you can attribute to the deficiency of *ghi*?—No; no such investigation has been undertaken by us and we can give no answer to that question.

44,249. Your conclusion is, therefore, founded upon first principles?—And as I have already observed at the beginning, on a certain amount of practical experience.

44,250. *Sir Henry Lawrence*: Is butter as effective as *ghi*?—Yes.

44,251. *Sir Thomas Middleton*: Is it not the case that a very minute trace of the necessary vitamin supplies what is required?—It depends how you define the term "trace."

44,252. It can only be ascertained by trial?—Are you prepared to define it? Will you put up a definite question?

44,253. You have not found any bad result in the way of an increase of scorbutic disease?—I did not state that at all. What I said was that we had undertaken no investigation of the type.

44,254. Then you have no evidence. You have not made any investigation?—I have told you that distinctly.

44,255. And you are not able to say whether or not there has been an increase?—That has been distinctly stated to you: I have said so in the beginning.

44,256. But you fear that there may be an increase?—I did not even commit myself to that.

44,257. What is the point then?—I stated that the position was that owing to the lack of *ghi*, which itself provides the vitamin C for a certain proportion of this population, we are always on the border line in regard to scorbutic disease.

44,258. How do you know you are on the border line?—We can know it perfectly simply; you come up to a stage where you give them a little push, towards pushing them over the border, as for instance concentration on the frontier as I instanced to the Chairman.

44,259. *Mr. Roberts*: Assuming that cattle-breeding does not pay in comparison to crop-growing, would you consider it reasonable to expect a sufficient supply of milk and milk products in the rural areas?—I think that there probably always will be, because the rural population will have enough milk for its own requirement.

44,260. Even if it does not pay the individual?—I think so, because that is the tradition and his feeling towards it. I think that will be the case; for instance, taking a small point, one's own garden, we will grow the thing though it does not pay us.

44,261. There is a tendency to cut down the milk requirements because he can get more money by growing crops?—That is the case; but I do not think he will carry it on in his own individual instance.

44,262. You do not think that the lack of milk is responsible to some extent for the high infant mortality in rural areas?—I can only say that it cannot be a very important factor, because the infantile death rate is provided by deaths mainly in the first fortnight of life.

(The witness withdrew.)

Mr. W. TAYLOR, I.V.S., Offg. Principal, Veterinary College, Lahore.

Replies to the Questionnaire.

QUESTION 15.—VETERINARY.—(*a*) The Civil Veterinary Department should be absolutely independent. There is no direct connection between veterinary work and agriculture.

It is not to be expected that the Director of Agriculture should be conversant with veterinary matters, and is at a disadvantage in dealing with them. This necessitates continuous references to the Veterinary officers, which entails a certain amount of time being lost.

Lt.-Col. W. C. H. Forster.

Moreover, the Agricultural and Veterinary Services have greatly expanded during the past few years, so that the Director of Agriculture, on account of stress of work, cannot give the time to the Veterinary Service which would normally be done.

In my opinion, the Chief Superintendent, the Superintendent of the Hissar Cattle Farm, and the Principal of the College should deal direct with the Financial Commissioner.

This can easily be accomplished by delegating the powers at present invested in the Director of Agriculture to each of the three above-named officers.

(*g*) The provision for further facilities for research is very desirable. At present, when the size of the country, and the incidence of animal disease is taken into account, the amount of research being done is negligible compared with what can and ought to be done.

I am very strongly of the opinion that it would be more advantageous to the country if provincial veterinary research institutions were set up in each Province.

I advocate the provincial laboratories in preference to an extension of the Muktesar laboratory because the disease problems in each Province vary considerably, and the workers should be able to study the disease in the field as well as in the laboratory. The field observations are sometimes most valuable in throwing light on the lines upon which the laboratory observations should be directed.

The obstacles and drawbacks of sending material from distant parts of India to Muktesar are obvious, on account of the condition in which it would arrive, and also on account of the loss of time in transit.

(*i*) I am of the opinion that there should be a superior veterinary officer with the Government of India.

The benefits which would be derived from such an appointment would be that there would be an officer to impress upon the Government of India the necessity of further recruitment in order to construct an efficient service, to co-ordinate the work of the different provinces, and to advise the Government of India on any matters under dispute in the different Provinces.

This officer should not be attached to any institution whatsoever, but be an entirely separate entity with the Government of India.

Oral Evidence.

44,263. *The Chairman*: Mr. Taylor, you are Professor of Pathology and Bacteriology, Civil Veterinary Department, Punjab?—I was until recently.

44,264. What position are you holding now exactly?—Officiating Principal of the Veterinary College, Punjab.

44,265. We have your note of the evidence which you wish to give. Do you wish to add anything to that at this stage?—No.

44,266. I see you are of the opinion that the Civil Veterinary Department should be absolutely independent of the Agricultural Department?—Yes.

44,267. You give us certain of your reasons; would you like to develop them at all?—No; I do not think that they need development.

44,268. If you look at the first page of your note, in answer to Question 15 (*a*) of our Questionnaire, you say: "In my opinion the Chief Superintendent, the Superintendent of the Hissar Cattle Farm, and the Principal of the College should deal direct with the Financial Commissioner?"—Yes.

44,269. Have you consulted the Financial Commissioner to discover how he would regard this intensive bombardment from these new directions?—Not officially, but I have unofficially.

44,270. There is a limit to which it is possible for any officer to extend his correspondence?—Yes.

44,271. Do you not think that if the Civil Veterinary Department is to be entirely independent of the Agricultural Department it will be necessary to place the whole of the Civil Veterinary Department under one Veterinary Officer?—No, not in the Punjab.

44,272. You think that these several officers should be responsible for their own sections of the work directly to the Government?—Yes. There are three totally independent portions of the department doing totally different work, and the Government would have three Veterinary advisers.

44,273. Are you satisfied with the equipment at the Veterinary College?—Yes, it is very good. It could be improved a little, and we are doing it gradually.

44,274. Are you satisfied with the curriculum?—Yes, the curriculum is good, but the students are not quite capable of dealing with it yet. It is the material which is bad.

44,275. How do you account for that?—The standard of admission is not high enough. The matriculation standard in this country is very poor indeed.

44,276. Are the salary and prospects sufficient to attract the right type of man?—I think so at present. The minimum standard of admission should be the F.Sc. for the four-years' course.

44,277. Is any research work being carried out at the college?—A little occasionally. It is rather spasmodic. We have no research staff; we have not enough men for that.

44,278. It is done by the teaching staff in their spare time?—Yes; and as most of them have six hours' work a day there is not much time left.

44,279. Is any veterinary research work being carried on in the Punjab?—Very little; not what I would call research.

44,280. There is no whole-time research officer employed in the Punjab?—No.

44,281. *Mr. Calvert*: At Sohawa?—There is no staff there capable of doing proper research work.

44,282. *The Chairman*: I observe from page 541 of your note that you are of opinion that Provincial Veterinary Research Institutions should be developed?—Yes, undoubtedly.

44,283. Would you leave the making of prophylactic vaccines in the hands of Muktesar?—Entirely.

44,284. Is it possible to support your opinion in favour of provincial research on the ground that the problems are local in their nature?—That is one reason. Moreover, it is necessary that the men doing the laboratory work should see the disease in the field. The men at Muktesar cannot go down to Madras, for instance, and back again very easily.

44,285. Would you cite one or two instances which in your view illustrate your contention that conditions and diseases in the Punjab are local in their nature and therefore cannot be dealt with adequately at Muktesar?—Surra.

44,286. That does not exist there?—Not to the same extent.

44,287. Is it the same disease?—Yes.

44,288. Are there any physical or other local conditions that affect the problem in the Punjab?—Muktesar is on a hill, and it is a plains disease.

44,289. Have you any other instances?—Most of the diseases dealt with at Muktesar are artificially procured by inoculation, and there are always differences between diseases so brought about and natural infections.

44,290. Do the research officers attached to Muktesar ever make journeys to the surrounding districts?—Yes, they have been to the college to study local conditions.

44,291. Do you think there is enough veterinary research work in this Province to justify the employment of a first-rate research officer and to pay the salary required for a man of that type?—I think there is enough for twenty or thirty.

44,292. Do you think the Province could afford to pay for them?—That I cannot say.

44,293. Should the Superior Veterinary Officer with the Government of India whose appointment you recommend be responsible for the conduct of Muktesar?—I do not think he should have anything at all to do with Muktesar.

44,294. Why?—The control of the Veterinary Service throughout India is a whole-time job. If he is to control Muktesar he will have to spend most of his time there, to the neglect of his other work.

44,295. *Sir Henry Lawrence*: You suggest there is enough work without Muktesar?—Decidedly.

44,296. *The Chairman*: Do you instruct your pupils in the administration of the simultaneous method of inoculation against rinderpest?—Yes.

44,297. Do you regard the average man passing out of your college as capable of administering that treatment with reasonable safety?—Yes.

44,298. It is not easy to do, is it?—I do not think there is any difficulty at all.

44,299. I was judging from the mistakes which have been made from time to time?—I do not think they were due to technique.

44,300. Were they due to the material, do you think?—*I do not know*; I should think it may have had something to do with the material, but not the technique.

44,301. Have you had disappointments in this Province?—I do not know of any. It does not come under me, of course.

44,302. But the teaching does?—Yes.

44,303. And to that extent you would be interested to discover how accidents, if there were any, occurred?—Yes.

44,304. Is one of the dangers attaching to this method the fact that other and different diseases, such as piroplasmosis, are liable to be conveyed to the animal?—Not unless the blood has been contaminated, and it ought not to be.

44,305. Contaminated after or before being extracted?—Perhaps before. It might be taken from a piroplasmosis animal.

44,306. Is it possible by any precautionary measures to be absolutely certain there is no such infection?—By microscopic examination.

44,307. That should be quite definite?—Yes, if the animal has not received any treatment for piroplasmosis. It is difficult to find the parasite if it has been so treated.

44,308. The appearance is obscured?—Yes.

44,309. Do you think the simultaneous method of inoculation is likely in the future to be generally applied in a Province like this?—The difficulty at present is in getting the virulent blood; it loses its virulence very quickly.

We have had trouble in the college in getting it for experimental purposes; it has arrived inert.

44,310. Is not the cost one of the difficulties?—I do not think the cost ought to prohibit it at all.

44,311. Is it your view that more research work requires to be done on the simultaneous method of inoculation?—I do not see at present how it could be improved.

44,312. If it were possible to grow the rinderpest organism on an artificial culture medium, would not that remove all risks?—I should think so, certainly.

44,313. Is not that a direction in which further research would be advisable?—Yes.

44,314. *Sir Thomas Middleton*: How long is your course at the Lahore College?—Four years.

44,315. The entrance qualification is matriculation?—Yes.

44,316. I think you complained of the quality of the students?—Yes.

44,317. You would prefer to have them at a later stage?—Yes, with a higher qualification, the F.Sc.

44,318. Would that mean two years in an Intermediate College?—Yes.

44,319. Are your facilities for teaching here as good as they are in Europe?—Yes. The laboratories are not quite large enough, but the facilities, compared with European ones, are quite good.

44,320. Your clinical material is probably better?—Yes.

44,321. So that there is nothing to prevent a satisfactory course in veterinary science at Lahore except the preliminary education of the students?—Yes.

44,322. That is a matter one would suppose that could easily be remedied. You have Intermediate Colleges?—Yes.

44,323. What is the difficulty? Is it the cost of the course?—No, but that it would take a student six years after passing the matriculation to qualify, two years at an Intermediate College and four with us.

44,324. That is the cost of the course to the student would be increased?—Yes, the length of time it takes to qualify after matriculation.

44,325. Is there any means by which you could compensate a man for the cost of his extra training? What is the initial pay?—Rs.100 a month.

44,326. In your view is that sufficient?—I think Rs.100 a month will attract a F.Sc. student.

44,327. What number of graduates do you turn out?—At present we turn out very few, because this course has only been going for six years and we have only had two final examinations. In the first two years we had only 18 applications for admission, because Government did not raise the pay; they kept the pay for two years at the same rate as for the old vernacular course, and so better-qualified men would not come to the college.

44,328. Since the pay has been raised has there been a distinct increase in the number of requests for admission?—Last year we had 190 applications for 30 vacancies.

44,329. You would have little difficulty in attracting candidates even if you exacted a higher entrance standard?—I do not think there would be much difficulty.

44,330. With regard to the relationship of veterinary officers to the Financial Commissioner, I think you used the phrase "three veterinary advisers"?—By that I mean they would be the ones to give information direct to the Financial Commissioner.

44,331. You mean three veterinary heads of departments?—Yes.

44,332. Each advising on his own job?—Yes.

44,333. Do you think control by the Government of India would be welcomed by the Veterinary Service?—Yes.

44,334. We find a tendency on the part of the Agricultural Service to escape from the control of the Government of India?—I do not know about that; I do not know what they have done in the Agricultural Department.

44,335. Do you think the Veterinary Surgeon would have no objection to control from headquarters?—No, I do not think so.

44,336. You instance Muktesar as being an unsuitable institution for the investigation of surra?—Yes, I do, because most of the animals would have to be artificially inoculated and the disease is not the same.

44,337. Was not Muktesar selected by Dr. Lingard in the first instance to work on surra?—Yes; there was not as much known about it then as there is now.

44,338. But at that time Dr. Lingard had been working on surra for a number of years?—Yes, he had.

44,339. And presumably he selected Muktesar as a suitable locality?—I am not quite sure, but I think Colonel Pease selected it.

44,340. *Mr. Barron*: At present the three heads of sections of veterinary work correspond separately with the Agricultural Department, do they not?—Yes.

44,341. You correspond with the Director of Agriculture?—Yes.

44,342. You do not go through the Chief Superintendent?—No.

44,343. Nor does the Superintendent of the cattle farm?—No.

44,344. So that the only change you are really suggesting is the substitution of the Financial Commissioner for the Director of Agriculture?—Yes.

44,345. Supposing that were not regarded as feasible, would it, in your opinion, be an improvement on the present system to have one chief Veterinary Adviser to Government?—Yes.

44,346. In your system, under whom would you place the research workers?—I should have a special Research Department.

44,347. Then you would create four departments corresponding directly with the Financial Commissioner?—You mean if the Research Department is created?

44,348. Yes?—I think a great deal depends on how large that department is going to be; one research officer is not going to do much.

44,349. Then with regard to the course at the college, if you got F.Sc. students, how long would you wish to keep them at the college?—Four years.

44,350. As at present?—Yes.

44,351. There would be no reduction in the course at the college?—None at all.

44,352. Can you give any reasons?—Yes, I can, because after having finished their F.Sc. they come to the College; they have forgotten a lot of the basal sciences; they have to start again; they do not know enough about them to warrant the concession of a year. Not only that, they do not take the same subjects in their biology, zoology and botany; more attention is paid to things like grasses in their botany in the College than in the ordinary F.Sc. course.

44,353. So that there would be a distinct increase in the cost of education of a veterinary officer?—There would be a difference of two years while he was taking his F.Sc.

44,354. Would that be popular?—I do not know; I do not think it would be from their point of view; I think it ought to be popular from the point of view of Government.

44,355. *Sir James McKenna*: Is the staff of your college up to strength at present?—No, it is not.

44,356. In what is it deficient?—We have not a Professor of Pathology and we are one or two Assistants short.

44,357. How many of your staff have the qualification of M.R.C.V.S.?—Three.

44,358. Any Indians?—One.

44,359. And two Europeans?—Yes.

44,360. Is the total European strength of the College two now?—Yes.

44,361. How many Provinces are dependent upon the Punjab Veterinary College for the training of their veterinary staff? Have you any arrangement with the United Provinces by which you take their men?—They do not send any now; we get them all from the Punjab and Indian States.

44,362. What are the United Provinces doing?—I think they send them to Bengal, because they do not pay them the initial payment that we do.

44,363. Practically you take men from the Punjab and the Indian States alone?—Yes.

44,364. With reference to the proposal to have a Veterinary Adviser with the Government of India, I think in answer to the Chairman you said that he should have nothing to do with Muktesar?—He should not be directly attached to it; it would be under him just in the same way as the rest of the Service would be, but he would have nothing to do with the direction of the research work.

44,365. Of course, you know that now the Veterinary Department is under the Ministers of each Province as a transferred subject; what control could he exercise in the Provinces? What work would be his principal duty if he has not the control of Muktesar as his his principal duty?—He would be able to co-ordinate the work of the different Provinces.

44,366. Do you think that is possible with the new form of Government?—Yes.

44,367. To co-ordinate what work? Research?—Yes.

44,368. Does not that anticipate a very increased amount of research in the Provinces?—I thought that was what was anticipated.

44,369. Until we have an advance in research, it does not look as if this officer would have very much to do, does it?—No, it does not seem so.

44,370. *Professor Gangulee*: Do you find that the demand for veterinary education is increasing in the Province?—Very much.

44,371. Are you able to entertain most of the applications?—We cannot entertain them all.

44,372. What percentage of the total applications are you able to take?—The applications vary in number; we take about thirty each year; that depends on the number of failures in the previous year; we cannot have more than fifty in a class.

44,373. Do these students pay fees?—Yes.

44,374. Do you charge any extra fees to the students coming from the Indian States?—Yes, they pay double.

44,375. Do students passing out of your college find difficulty in getting employment?—Not at present.

44,376. Has any passed student from your college taken to private practice? Is there a great scope for private veterinary practitioners?—There is none at all in the Punjab.

44,377. So that most of the students who pass out are being engaged by the Government departments; is that the position?—Yes.

44,378. There is a limit to that?—There will be; at present there is no limit; we can absorb as many as we can turn out for the next few years.

44,379. With regard to research work, do I understand that at present the teaching in your college is divorced from research work?—There is no definite research work done; it is done in spasms; if there is a little bit of work to be done it can be done, but no solid research work can be done at the college with the present staff; they have not the time.

44,380. But Colonel Walker did his work on the foot-and-mouth diseases in your Veterinary Department?—Yes, we did it together.

44,381. Is that work being followed up in your college?—Yes, it is; I sent a man only a fortnight ago to deal with an outbreak at Hissar with that treatment.

44,382. Do you find the treatment—control of the disease by chemotherapy—which you have discovered—successful?—It stopped the whole outbreak.

44,383. The teaching in the College is now in English, is it not?—Yes.

44,384. It was originally in the vernacular?—Yes.

44,385. Do you find there is a great advantage in having it in English?—There are advantages and disadvantages; the disadvantage is that the students' English is not sufficient to follow the lectures; the advantage is that they have access to English text books.

44,386. *Mr. Calvert*: Do you think your English-trained students will be as willing to go and live out in small villages as your vernacular-trained men?—I think so; it is rather early to say that,, because we have turned out so few; we have only turned out ten or twelve.

44,387. There is generally a complaint that these highly trained persons in various departments do not like living in jungly places?—But when they are all of the same class they will have to go; they will not be able to choose.

44,388. Do you think they will be just as sympathetic with the cultivator as your present men are?—Yes, just as much. When we are told to take agriculturists instead of non-agriculturists it is a farce; they know no more than the non-agriculturists.

44,389. Would your six years' course for the F.Sc. tend to keep away the sons of cultivators?—Yes, it would, because they are not sufficiently qualified; the time has passed when we ought to take in these ignorant men to deal with cattle diseases.

44,390. There is one peculiar feature which we find all over India: that whereas the local Governments and Ministers and politicians are very anxious to retain complete control over agricultural research, they are entirely indifferent to veterinary research; can you explain that?—Yes, it is probably because they are politicians.

44,391. Any suggestion to extend Pusa or to control research from Pusa meets with opposition, and they seem to be perfectly ignorant of the fact that research in veterinary work is confined to the Government of India; is it due to lack of interest in veterinary research?—I think so, and also because there is very little revenue obtained from it; there is revenue obtained from agricultural research.

44,392. Do you think there is much interest among Members of the Council in such questions as veterinary research?—I do not think there is very much; I do not know very much about that: I do not take much interest in the Council; but I do not think there is a great deal of interest shown in veterinary research.

44,393. If you took the opinions of the Members of the present Legislative Council on two questions: (*a*) Which is the central research institute in India, and (*b*) what research is being done in the Punjab, could they answer?—No.

44,394. *Mr. Kamat*: Your complaint is that the Government of India also are indifferent to veterinary research as compared with agricultural research?—I think so.

44,395. So that they are in the same boat as the Councils?—Yes.

44,396. *Mr. Barron*: In answer to Sir James MacKenna, you said there were only two European Professors at the College; has a third one been applied for from England?—Two have been applied for: a Research Officer and a Pathologist.

44,397. I was referring to the teaching staff?—One, the Pathologist.

44,398. The application was sent home some time ago, was it not?—Yes, nearly a year ago, I should think.

44,399. Can you give us the views of veterinary surgeons generally on the terms offered?—The terms are supposed to be insufficient to attract anyone.

44,400. *Sir Thomas Middleton*: What is offered?—Rs.600, I think it is. *M. Barron*: Starting with Rs.600.

44,401. *Sir Thomas Middleton*: Have you any Fellows of the Royal College of Veterinary Surgeons working here?—No.

(The witness withdrew.)

Lt.-Col. B. C. BATTYE, D.S.O., A.M., R.E., A.I.C.E., A.M.I.E.E., &c., Chief Engineer, Punjab, P.W.D. Hydro Electric Branch.

Replies to the Questionnaire.

QUESTION 9.—SOILS.—(*a*) and (*c*) The drainage of water-logged areas (and also areas likely to become water-logged) is the subject of special research in the Irrigation Branch of the P.W.D. There is little doubt that the availability in 1930 of cheap hydro-electric power will enable this problem to be solved by means of pumping.

QUESTION 10.—FERTILIZERS.—(*a*) and (*e*) Yes; with introduction of improved cane in the Punjab there will undoubtedly be a demand for an artificial fertiliser. In this connection I attach herewith some notes prepared by Mr. A. T. Arnall, recommending the installation of a plant using the Casale process of producing anhydrous ammonia, from which sulphate of ammonia could readily be prepared, using raw materials, all of which are obtainable in the Province. (See Appendix II.)

(*f*) Cow-dung is burnt, first because of the calorific value of the undigested callulose contained therein, and second because of the ease with which this material may be pressed into cakes suitable for use as fuel. Until the peasant is educated to the advantages of using cow-dung as manure instead of fuel, this practice will continue. Agricultural college and school education would therefore appear to be the best solution. The peasant for some time to come will be unable to purchase expensive fuel as substitutes and must fall back upon the raw product of the farm.

It is possible that fodder crops grown to take the place of the waste "stalks" now eaten by animals would not only improve the quality of the live-stock but would release this waste to be compressed by machinery into cakes of convenient size and weight for fuel purposes. Electrically driven presses of this type will become a practical proposition as soon as hydro power is available.

QUESTION 14.—IMPLEMENTS.—(*a*) This opens up the whole question of the use of electric power on the farm. The subject has only quite recently come to the fore in Great Britain and America, largely due to the developments in this direction in countries like Norway, Sweden and Denmark.

It will probably be some time before a satisfactory solution can be placed on the market for ploughing with electric power, but there are great possibilities for the substitution of electrically driven pumps for bullocks in connection with small scale well irrigation. In this connection see paragraphs 10 and 20 to 23 of the attached unofficial pamphlet expressing the views of the committee got together in the winter of 1924-25 in order to draw attention to the advantages likely to be derived by agriculture in the Punjab from the supply of cheap hydro-electric power.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*b*) and (*d*) To start subsidiary industries requires three things in addition to raw materials:—

(i) Power.
(i) Motors for converting the source of power into mechanical power.
(iii) Machines and the actual process machinery to be driven by the above.

It is the ambition of this department to be able to supply the first two in every farm and village within 20 miles of the transmission system now being constructed from April, 1930. The provision of the first (i.e., power) involves the solution of certain highly technical and commercial problems connected with the transforming down of energy at a reasonable cost from very high pressure (such as that used on our transmission lines) to domestic pressures for use in each farm and village. This problem is exercising the best brains in the electrical industry to-day and is well on the way to a solution.

The provision of a motor is secured by a hire-purchase system, which is included in the hydro-electric scheme. This will enable consumers to obtain electric motors and the equipment connected therewith at actual cost price on a deferred payment system spread over a term of years.

It would appear that the provision of the machinery to be driven by the motors could also be secured by some form of a hire-purchase fund, initiated under the control of the co-operative societies assisted by the technical departments, e.g., the Public Works Department and the Department of Industries.

APPENDIX I.

WATER POWER IN THE PUNJAB.

History.—Prior to the War little attention was paid to the water power resources of this Province.

A pioneer development was carried out on the Jhelum in Kashmir State, followed shortly by a smaller but in some ways more complicated project for the supply of electricity to Simla. Simultaneously small schemes were constructed in Chamba and Jammu for the supply of the capital towns of these States.

During the War, however, considerable attention had been directed to the importance of conserving fuel resources and of developing water power as a substitute.

In the summer of 1919 the Punjab Government accordingly decided, at the suggestion of Mr. F. L. Milne, M.I.E.E., to investigate the power possibilities of a large bend of the river Sutlej near Bhakra. It was originally Government's intention to make simultaneously a hydro-electric survey of the whole Province, but owing to the difficulty of finding suitable staff without interfering with the particular investigation in progress, the survey was not actually commenced until October, 1921, after the investigations on the Sutlej had been completed.

This survey was made by Major R. N. Aylward, D.S.O., M.C., A.M.I.C.E., and was continued uninterruptedly for the next three years, and was eventually completed in July, 1924. The resulting report is a very complete one, and occupies eight volumes. For the benefit of the lay reader the whole of this report has been summarised in Part A, which can be obtained from the Government Press at a comparatively small cost. The report is believed to be the only complete hydro-electric survey so far produced in India and, with certain exceptions, is one of the most complete so far published in any country.

The investigations of the proposed site on the Sutlej River were completed in July, 1921. The report was published in considerable detail so as to facilitate reference in years to come, because it was considered at the time that there was little likelihood of the project maturing immediately. The report recommended that no work should be started until further expert advice had been obtained regarding certain technical features peculiar to the site. Of these the most important (and that which eventually led to the postponement of the project) was connected with the length of the pipe line, which was so long compared to the head available that it was anticipated that difficulties would be experienced in the governing of the turbines if the project was to be self-contained and not working in parallel with other installations. A method of getting over this difficulty was suggested similar to that which had been adopted tentatively on one or two plants in Western America; it was thought advisable, however, to obtain further information with regard to the results obtained at these stations before recommending its adoption locally. The proposal in question involved the dissipation directly into heat of large quantities of kinetic energy, which still remains one of the unsolved problems of hydraulics.

As a result of further enquiries Government were advised to postpone the development of the Sutlej site until such time as the project could be made to operate in parallel with existing stations. Acting on this advice the Electricity Board in April, 1922, decided to shelve the Sutlej scheme till a later date, and to begin its programme of development on some high head site, of which a number were known to exist on the river Beas.

While these matters were under consideration, the site on the Uhl river was discovered in June, 1922. This site was just the right kind to replace the Sutlej as a first development, besides being superior to other sites so far discovered. As it was also believed to be capable of meeting all the requirements of the present generation and thereby unifying the supply of the whole eastern half of the Province, the Electricity Board in September, 1922, after careful deliberation, recommended Government to drop all local propositions and concentrate on the site in Mandi State.

The site was surveyed during the winter of 1922-23, and a detailed project was worked out during the following summer and completed by December, 1923.

The report is contained in five volumes dealing respectively with the hydraulic, electrical, railway and the financial and general aspects of the project. Before taking any further action, Government decided to have the project thoroughly investigated by a leading firm of Consulting Engineers in London. In order to assist the Consulting Engineers, and at the same time to make sure that no local considerations had been overlooked, it was

decided to have the scheme examined locally by three committees of experts dealing respectively with the hydraulic, revenue and railway features of the undertaking.

These committees all reported favourably on the project and recommended its adoption at once. Their reports were embodied in the project, and the whole submitted in March, 1924, to two leading firms of Consulting Engineers in London, who examined the project on the electrical and hydraulic side respectively. The first firm then examined the scheme as a whole with special reference to its financial prospects, and in July, 1924, recommended Government to proceed with it immediately.

The scheme was next examined in great detail by the Finance Department and eventually by a sub-committee of the Punjab Legislative Council. It was finally passed by the Council without a division in March, 1925.

During the following six months negotiations were completed with the Railway Department for the transfer of the railway portion of the project to that department for construction and arrangements completed for the formation of a separate branch of the Public Works Department for the construction of the undertaking. The necessary organization was brought into being last winter, and works have been in progress since April, 1926. If the present programme is adhered to, the first stage should be completed by the spring of 1930.

The Resources of the Punjab.—The concentration of all the energies of the available staff on the Uhl River Project naturally diverted attention from the other power resources of the Province, since that Project itself will alone and unaided be able to meet all the demands of the Province as far north as Sialkot, Lyallpur and Gujranwala for the next twenty years. It follows, therefore, that the other water-power resources of the Province, at any rate in the south-eastern section, have ceased to be of immediate practical interest.

Any survey of the water-power resources of the Punjab must of necessity fall into separate sections dealing respectively with the power available in each of the main rivers of the Province. No proper appreciation, however, of these resources is possible without first understanding the physiographical and geological construction of the Punjab Himalayas. The first portion of the general summarising report of the hydro-electric survey, therefore, describes the geography and geology of the Punjab Himalayas, necessarily based upon the work of Messrs. Burrard and Hayden, which has been of great assistance to the engineers engaged on the survey.

The results of the survey may be briefly summarised as follows:—

Geographically the Punjab rivers, to be investigated fall into four classes:—

(1) The Trans-Himalayan rivers, i.e., the Indus and the Sutlej, rising beyond the Great Himalayan range, and which have a much flatter slope than the rest.

(2) The Mid-Himalayan rivers, i.e., the Jhelum and the Chenab, rising on the Indian side of the Great Himalayan range, but beyond the Pir Panjal.

(3) The Cis-Himalayan rivers, i.e., the Ravi and the Beas, rising between the Dhauladhar and the Pir Panjab, with steeper slopes than either of the former.

(4) The Sub-Himalayan rivers, i.e., the Jumna and several tributaries of these Punjab rivers, rising in the Dhalaudhar range and crossing no main range of the Himalayas at all.

The slope of the Indus is so flat that few power sites exist on the main river, although there must be a number of remarkable sites in the inaccessible area beyond the Great Himalayan range, which is of course beyond the area investigated.

There are four sites on the main river, but with available heads varying from 11 to 43 feet. In spite of this, however, owing to the very large dis-

charges available, over 100,000 kilowatts could be developed, but the cost per kilowatt would be high.

As regards the tributaries, an excellent site capable of developing over 50,000 kilowatts exists at the point where the irrigation canal fed by the Swat, a sub-tributary of the Kabul river, emerges from the Malakand Tunnel; the other tributaries are disappointing.

The Sutlej, on the other hand, cuts a straight course through all three ranges, and although many wonderful sites probably exist beyond the Great Himalayan range and on some of the tributaries beyond the Dhauladhar, the river itself is so flat that, like the Indus, it is, with the single exception noted below, relatively devoid of good sites on the main stream. It has also a remarkably narrow catchment area within the limits of investigation, and therefore few tributaries of importance from a power point of view.

The Bhakra bend site, on the main stream, is capable of delivering 88,000 kilowatts on a 363 feet head. If the Bhakra dam is built, this site would be capable of delivering three times this quantity for 10½ months in a year, but would run short of the extra water required during the remaining six weeks. As already explained this Project has been fully investigated and reports published in great detail.

The remaining five rivers contain most of the sites of importance reported on. The majority of the best sites on the main streams occur where the rivers cut through the main ranges referred to above.

Of these five the Ravi as a whole is somewhat disappointing, and has no good sites, with the possible exception of one on a tributary, the Ojh.

The Jumna, which forms the boundary between the Punjab and the United Provinces, is also disappointing in spite of its comparative steepness, and no sites of any importance, with the exception of a small one on the Giri, have so far been located. On the upper reaches of the Tons there are probably many good but inaccessible sites.

The Chenab has one valuable site on the main river at Riasi in Kashmir State capable of yielding 40,000 kilowatts continuously.

Of the three tributaries of the Chenab, the Ans and Malikhani Tawi lend themselves to a valuable combined three-stage development capable of giving over 50,000 kilowatts, while the Jammu Tawi, if taken through to the catchment of the Ojh, would quite probably yield over 100,000 kilowatts in a three-stage development in the valley of the latter. This project has not, however, been investigated on the ground, and is at present merely a proposal.

With the exception of the Beas, the Jhelum is the best of the Punjab rivers. Its value to the Punjab, however, is somewhat abated by the fact that all the sites are located in the territory of Indian States. There are two sites on the main river, one already partially developed by the Kashmir State at Baramula, where the river cuts through the Dhauladhar range, while the other on the Domel loop is capable of delivering more than 100,000 kilowatts in one development. The two large tributaries of the Jhelum, the Kunhar and Poonch, also contain valuable sites—that on the Poonch being a multi-stage development capable of yielding well over 100,000 kilowatts.

The Beas is without doubt the most valuable river in the Punjab. With one exception all the sites are in British territory, and the total gross yield is no less than 832,070 kilowatts. The main river itself, if developed in the Kulu valley, is capable of delivering nearly 250,000 kilowatts. If, however, this were diverted through the Dhauladhar range into the Uhl valley—a project by no means outside the limits of modern engineering—over half a million kilowatts could be generated on the site now being developed which utilises the waters of the Uhl. Of the tributaries of the Beas, the Parbati and the Sainj alone could deliver no less than 165,000 kilowatts in six developments, while the Uhl, on the lines now being developed, will be capable of yielding eventually no less than 145,200 kilowatts.

Lt.-Col. B. C. Battye.

It will be seen that the three rivers providing the greatest number of really commercially useful sites are the Beas, the Jhelum and the Chenab. The following is a general summary of the capacity of each river, from which it will be seen that there are no less than 1¾ million kilowatts capable of commercial development in the Punjab at present provided markets existed for their output. Of these, at present only 8,200 kilowatts have been developed, and a further 36,000 kilowatts is now under development:—

Item.	Name of river.	Power capable of economical development.
1	Indus	210,000 kilowatts.
2	Jhelum	270,000 „
3	Chenab	140,000 „
4	Ravi	190,000 „
5	Beas	830,000 „
6	Sutlej	80,000 „
7	Jumna	50,000 „
	Total ...	1,770,000 „

Developments so far completed or under construction.—The Kashmir and Simla projects already referred to are essentially medium head developments, using Pelton wheels and high-speed generators of a standard type in which the heads, varying from 390 feet in Kashmir to 540 feet in Simla, developed artificially by the diversion of water from the river into a flume following the contour and ending in a forebay. The Kashmir scheme was constructed by Lieutenant-Colonel Joly de Lotbiniere, R.E., and followed older American practice, using a timber flume and a small forebay, while the Simla project is smaller but more elaborate and more in accordance with European practice, containing, in addition to decantation chambers, a large forebay reservoir, horizontal pressure duct, surge tank and many of the features embodied in the largest undertakings of this nature.

The Simla project, which was designed and constructed by the writer, is chiefly of interest from a scientific point of view on account of its including features which at the time constituted world's records. This project was constructed primarily in order to supply power for pumpng water into Simla. The plant pumps water to a height of 2,760 feet in one lift, which at the time of its installation constituted a world's record for high lift pumping in one lift. The satisfactory operation of these pumps led to the adoption of this type of plant for an even greater head in the new Guma water works recently constructed, where the pump actually lifts water over 4,000 feet in one stage, which again constitutes a world's record.

The Jammu scheme makes use of a local irrigation canal, and is chiefly interesting as being one of the first attempts to combine a public supply of power with irrigation.

The Kashmir and Simla schemes are particularly of interest as illustrating the extent to which electric light when based on water power is taken up by the masses. At the present moment every bazar shop in Srinagar and Simla uses electric light at a cost varying from 12 annas to a rupee per month.

The Kashmir and Simla schemes were followed immediately by an interesting project in the Amritsar District constructed to the designs of Mr. John Ashford, O.B.E., M.I.E. (Ind.), assisted by Mr. Stephen Legget, M.I.E. (Ind.), primarily as an experiment to test the possibilities of pumping up sub-soil water by tube wells.

This is a small scheme, and was the first example of hydro-electric on canal falls in the Punjab. The Amritsar project was followed by a similar

but more up-to-date undertaking at Renala initiated by Sir Ganga Ram, Kt., assisted by Mr. E. S. Crump, I.S.E., and Mr. Stephen Legget. This undertaking is chiefly of interest for the fact that it was the first undertaking of its kind in the Punjab, depending solely on private enterprise. This scheme consists of multi-runner open flume type turbines similar to those at Amritsar, with a similar type of gear drive. The project embodies an interesting and up-to-date syphon overflow, the first of its kind to be used in the Punjab.

The Renala scheme is interesting as being the first application of the power available at low canal falls for pumping up water from canals on to uncommanded areas, a type of development destined to have a considerable future in the Province as soon as further supplies of irrigation water are available.

At the present moment the only other undertaking in hand is the Uhl River project already referred to.

This has many interesting features, none of which, however, are especially novel in hydro-electric development.

This project makes use of the snow-fed waters of the river Uhl, a tributary of the Beas, which joins the latter in Mandi State about five miles east of the town of that name.

Water will be diverted through 2½ miles of 9 feet diameter tunnel located in solid granite and at an altitude of 6,000 feet, and then dropped through a fall of 1,800 feet to the first power station, where 36,000 kilowatts can be generated. From this station power will be distributed at a pressure of 132,000 volts *via* Pathankot and Dhariwal to Lahore and Amritsar, with branches to Lyallpur, Ferozepore and Ludhiana. This forms Stage I of the project and that now under construction.

The supply of water at present available can be doubled by the construction of a dam 260 feet high. This will create a small lake large enough to store sufficient water to increase the available supply of power to 70,600 kilowatts. In this second stage of development it is proposed to extend the transmission system so as to supply Simla, Ambala and Patiala in the east and also Gujranwala, Sialkot and possibly Montgomery and Fazilka in the west.

A further development contemplated is to take the water through three miles of duct and drop it through a second and lower fall of 1,200 feet, generating another 48,000 kilowatts, thereby providing a total of 118,600 kilowatts. This forms the third stage of the scheme, in which it is proposed to extend the transmission system so as to supply Saharanpur, Meerut, Delhi, and also the districts of Karnal, Panipat and possibly Rohtak as well. The whole system when thus extended will be able to deliver power to over 47 towns extending from Delhi and Rohtak in the south to Sialkot and Lyallpur in the north, at an average cost of Rs.95 per kilowatt year, which is equivalent to 5 pies a unit. There is also a third fall of 750 feet which could be developed later if required; but this has not yet been surveyed.

There already exists a sufficient demand for power to justify the construction of the first stage. There is, however, good reason to believe that five years after the completion of the first stage the amount of motive power installed in the Province will have nearly doubled. Statistics show that the motive power in the area served by the undertaking has been developing steadily for the last twenty years at the rate of approximately 10 per cent. per annum, i.e., it has been doubling every ten years. This development of motive power in the Province can be directly co-related with the development of irrigation, and as there are still several promising irrigation projects under construction or contemplated, there is no reason to anticipate a cessation in the growth of motive power.

The estimates of power demand and revenue upon which the undertaking has been based do not allow for any increase in the rate of development of

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motive power due to the demand created either by the project itself or any of the big irrigation projects now in hand. The possible electrification of the railways, the appearance of new industries, and the application of electric power to irrigation have not been taken into account. Such developments may, however, be looked for with some confidence, and it is quite possible that the demand for power for irrigation and drainage purposes alone will be sufficient in the next twenty years to use all the available power.

APPENDIX II.

Sketch of "The Possibilities of Manufacturing Ammonium Sulphate in the Punjab as a Manure for Sugar-cane."

By Mr. A. T. Arnall, M.Inst.C.E.

1. *Area under sugar-cane.*—India, with 2,500,000 acres under sugar-cane (excluding Indian States) is, in point of area, the chief grower in the world; it nevertheless imports sugar, principally from Java and Mauritius, and in large and increasing quantities. The Punjab, which is the second largest grower among the Provinces, has an area under the cane varying from 350,000 to 400,000 acres, divided among its 29 districts in year 1921-22 as follows:—

District.	*Acres.*	*% of normal area.*	
Hissar	1,028	60	
Rohtak	24,266	65	
Gurgaon	7,578	45	
Karnal	23,284	75	
Ambala	11,598	64	
Simla	1	—	
Kangra	3,505	62	
Hoshiarpur	19,018	73	
Jullundur	26,064	93	
Ludhiana	12,956	110	
Ferozepore	2,621	72	
Lahore	10,647	79	
Amritsar	24,784	83	
Gurdaspur	49,973	88	
Sialkot	24,449	70	
Gujranwala...	21,099	107	
Sheikhupura	16,833	120	
Gujrat	8,814	91	
Shahpur	9,869	124	
Jhelum	84	31	
Rawalpindi...	47	46	
Attock	938	81	
Mianwali	49	123	
Montgomery	10,494	243	
Lyallpur	49,312	112	
Jhang	1,973	98	
Multan	5,324	182	
Muzaffargarh	6,662	125	
Dera Ghazi Khan	101	149	
	325,560	—	(Irrigated)
	47,811	—	(Unirrigated)
	373,371	89	Total for 1921-22
	456,967		Total for 1920-21.

2. *Yield of sugar.*—Sugar-cane yields a higher percentage of sugar than any other plant; but, although it is indigenous to India, the best varieties are now found in countries where it is grown under European or American planters. Yields up to 8,000 lbs. of gur (raw sugar) per acre have been obtained under careful cultivation and high manuring in the districts of Poona (Bombay) and Burdwan (Bengal), equal to results obtained in Java and the West Indies; but the average yield throughout India is estimated at not more than 2,240 lbs. per acre. In Bombay and Madras the yield varies from 5,600 to 6,700 lbs.; in Bengal from 3,500 to 4,800 lbs.; and in the Punjab from 1,700 to 2,240 lbs. per acre.

3. The low yield from the cane in the Punjab is said to be due to (i) the actual amount of sugar produced in the crop per acre of cane being very low; (ii) an unnecessarily large amount of sugar being lost through imperfect extraction of the juice; (iii) losses of sugar through inversion to glucose. In commenting upon these causes of low yield, Messrs. W. Roberts and O. T. Faulkner (*A Text Book of Punjab Agriculture*, 1921) observe that the prospects of radical improvement are not very promising, the climate in most parts of the Province seeming to prevent good varieties of sugar-cane from ripening properly every year; some improvement in this respect may be possible, but it must be remembered, they say, that the amount of water, manure and cultivation essential to the cane tells against it in competition with other crops especially cotton, for which the climate in most parts of the Punjab is said to be more suitable.

4. Cane-crushing (in mills driven by bullock-power) and *gur*-making are executed in the Punjab by the individual farmers on their small holdings. It has been suggested that an increase of 20 per cent. more juice might be effected in the crushing of the canes by establishing factories, such as exist in the United Provinces, using batteries of nine or more rollers driven by steam or oil engines; but, to be successful, use would have to be found for the engines during the part of the year when they are not required for cane-crushing, and the area under cane, easily accessible to each factory, would have to be large.

5. It seems probable that an increase in yield of *gur* per acre of sugar-cane in the Punjab could be economically effected by any one or more of the following means:—(i) the introduction of better varieties of cane; (ii) the use of artificial nitrogenous-manures; (iii) the concentration of areas under sugar-cane, and the establishment of modern, power-driven sugar-mills. In this Note I shall only consider the second of these means, the use of artificial nitrogenous-manures.

6. *Cost and profit from sugar-cane.*—Messrs. Roberts & Faulkner (*A Text Book of Punjab Agriculture*, p. 147) give the following estimates of the cost of cultivation and the profit per acre of sugar-cane in the Punjab, under existing conditions:—

Outlay—

	Rs.	*as.*	*p.*
Six ploughings at Rs.1-8	9	0	0
Farmyard manure (residue from maize)	18	0	0
Seed—8 marlas at Rs.1-12	14	0	0
Preparation of seed	2	0	0
Seed-bed preparation	2	0	0
Sowing	4	0	0
Three hoeings	18	0	0
Labour charges for 12 waterings	3	0	0
Land revenue and water rate, &c.	15	0	0
Cane crushing	32	0	0

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Outlay—*continued.*

	Rs.	*as.*	*p.*
Furnace feeder (fireman)	7	0	0
Gur-maker	7	0	0
Hiring of machine	5	0	0
Total cost	Rs.136	0	0

Return—			
Yield of 25 maunds of *gur* at Rs.84	200	0	0
Less cost of cultivation	136	0	0
Profit per acre (excluding rent	Rs.64	0	0

(1 maund equals 82.286 lbs.)

The prices per maund of *gur* prevailing in Lahore at harvest time during the 12 years ending 1921 were:—1910, Rs.5; 1911, Rs.4-2; 1912, Rs.5-8; 1913, Rs.4-15; 1914, Rs.4-11; 1915, Rs.5-5; 1916, Rs.5; 1917, Rs.5; 1918, Rs.6; 1919, Rs.9-2; 1920, Rs.11-8; 1921, Rs.8.

7. *Manuring.*—In the use of artificial manures, India has not assumed the importance that other countries have; vegetable and animal manures, which are largely produced in India, are utilized to some extent, but the demand at present for artificial manures is mainly from European planting communities for use on tea and coffee estates.

8. Manures are generally divided into four classes: phosphates, potassic, nitrogenous, and calcareous. In India the phosphatic requirements are mostly met by oil-cakes and bones, though basic slag and superphosphate are also used to a limited extent in special mixtures for special crops. As regards the Punjab, "results appear to indicate that very little benefit is at present found in the use of phosphatic manures in most of the ordinary systems of agriculture adopted" (Report by a committee of the Board of Agriculture, Poona, 1917).

9. Potassic manures are not generally considered of importance in India, and are not used except to a very small extent in special mixtures for tea, coffee, garden crops, &c.

10. Most Indian soils are very deficient in nitrogen, and therefore very responsive to dressings of nitrogenous manures. Bulky organic manures like oilcake and cattle dung are said to be more suited to Indian soils than concentrated manures; and although the demand for the latter for special, irrigated crops (such as sugarcane, tobacco, garden crops, &c.) is increasing, and is likely to increase, their wholesale use by the ryots is not considered at present possible, owing to want of facilities for their cheap supply and transport.

11. The important artificial nitrogenous-manures in use in India are nitrate of soda and ammonium sulphate; both of these have been tried and found useful as a source of nitrogen, either to supplement the use of organic manures or in complete mixtures. Trials in the Bombay Presidency with sulphate of ammonia on sugarcane have proved that on new lands, which have only been growing sugarcane comparatively recently, better results are obtained by mixing sulphate of ammonia with safflower, than from either cake or sulphate of ammonia alone. The use of sulphate of ammonia is reported to be spreading fast in the Bombay Presidency for sugarcane on the Deccan canals (the present area under sugarcane on the Deccan canals is under 30,000 acres; it is expected to increase in the next twenty years to 150,000 acres, with expansion due to new canals).

12. Sugarcane must be sown on manured land, and it responds well to a heavy outlay on manures. In the Punjab farmyard manure is used

almost exclusively for this purpose; it is seldom applied directly to the land before planting the cane, chiefly because freshly applied farmyard manure appears to attract white ants, which damage the cane, and also to delay the ripening of the cane; the greater part, or more usually all, of this manure is therefore applied to the preceding maize crop. One would think that ammonium sulphate should possess definite advantages in this respect over farmyard manure—but I have no information on the point.

13. A series of manurial experiments on various crops were made by the Government of the Punjab at their Lyallpur farm, and reported upon in 1920 by Mr. O. T. Faulkner, late Deputy Director of Agriculture, Lyallpur. These experiments were made with the object of discovering the dominant manurial ingredient for each of the common crops of the canal colonies of the Punjab (sugarcane, maize and cotton during the summer season; and wheat, *toria* and gram during the winter season); a consideration of the economic aspects of the question was postponed for subsequent investigation. Their utility, however, is said to have been impaired by the absence of unmanured control plots, and moreover the way the crops were rotated was not typical of the practice of the district. The results obtained from sugarcane are given in the following table, which shows the relative yields from plots variously treated with artificial fertilizers compared to yields from plots treated with farmyard manure.

Experiments at Lyallpur farm.

Year.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
Treatment:	%	%	%	%	%	%	%
Farmyard manure (4 tons per acre).	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Bonemeal (304 lbs. per acre).	82·8	—	94·1	—	—	94·4	—
Bonemeal (304 lbs.) and lime (560 lbs. per acre).	—	—	—	147·0	—	—	92·2
Gypsum (560 lbs. per acre).	—	35·8	—	—	55·5	—	—
Basic slag (656 lbs. per acre).	112·3	—	71·2	—	—	77·0	—
Lime (560 lbs. per acre)	95·7	—	66·9	—	—	70·9	—
Calcium cyanamide (397 lbs. per acre).	—	122·6	—	—	97·5	—	—
Calcium nitrate (550 lbs. per acre).	—	122·9	—	—	111·6	—	—
Ammonium sulphate (318 lbs. per acre).	—	119·6	—	—	130·9	—	—
Ammonium sulphate (318 lbs.) and lime (560 lbs. per acre).	—	—	—	171·5	—	—	136·6
Ammonium sulphate (318 lbs.), bonemeal (304 lbs.), and lime (560 lbs. per acre).	—	—	—	144·1	—	—	138·7
Ammonium sulphate (318 lbs.), calcium nitrate (450 lbs. and superphosphate (213 lbs. per acre).	—	—	—	144·1	—	—	134·5

14. In reviewing these experiments, Faulkner observed that sugarcane gave a substantially increased yield when manured, the increase amounting to 20-40 per cent. in all normal years; it was only in 1911 and 1914, when the whole crop was inferior, that the relative increase due to manuring was less; the dressings of farmyard manure caused subsequent and consistent increases of yield, but the dressings of soluble nitrogenous compounds caused a much greater increase. He arrived at the conclusion that, so far as could be seen from the experiments, nitrogen is by far the most important element of plant food controlling the growth of crops, "grown under the conditions of these experiments"; and that the application of nitrogenous manures to sugarcane and maize "always markedly increases the yield." Gypsum and phosphatic manures appeared to fail, under the conditions of the experiments, in producing such increases in yield as would render their use profitable on any of the crops experimented upon.

15. From more recent trials in the Punjab it has been found that ammonium sulphate alone, applied at the rate of 350 lbs. per acre, gives the best economic yield. It not only improves the quality of the cane, but also increases the out-turn of cane per acre. Of all the manures tried (*a*) ammonium sulphate (*b*) superphosphate (*c*) lime, and (*d*) complete manure (i.e., a mixture of (*a*) and (*b*) along with potassium sulphate), ammonium sulphate alone has been found to be capable of bringing any excess profit to the zamindar; in this case the excess profit is said to come to about Rs. 50 per acre. The results, however, are subject to experimental errors, and require further confirmation. (I have no details of these recent experiments.)

16. *Irrigation in the Punjab.*—An important feature of the Punjab is that it is extensively irrigated; out of a total cropped area of 27,000,000 acres, 12,200,000 acres or 45 per cent. are irrigated; of this irrigated area 8,000,000 acres are irrigated by Government canals, 500,000 acres by private canals, 200,000 acres by tanks and other sources, and 3,500,000 acres from wells. The areas under the chief crops in 1916-17 were:—

——	Unirrigated.	Irrigated.	Total.
Wheat	4,600,000	4,900,000	9,500,000
Gram	4,200,000	900,000	5,100,000
Maize	800,000	500,000	1,300,000
Cotton	200,000	900,000	1,100,000
Rice	300,000	800,000	1,100,000
Sugarcane...	50,000	350,000	400,000
Toria	—	400,000	400,000

17. Messrs. Roberts and Faulkner (*A Text Book on Punjab Agriculture*, p. 27) say that "with cheap electric power it may before long be possible to have nitrogen manure manufactured in the Punjab, and if it could be turned out at from Rs.8 to Rs.10 per maund, there should be a great future for it as a manure for wheat and cotton." I believe nitrates are the best for wheat, about 120 lb. per acre being required.

18. *Manufacture of ammonium sulphate.*—The chief raw materials required are cheap electric power and gypsum. The Government of the Punjab will probably begin this year to construct the first stage of the Uhl river hydro-electric project together with the first stage of the power distribution system, which is designed ultimately to supply electricity throughout the Punjab, and to Delhi. I am told that, during the first

four to five years of operation, by-product (or off-peak) power will be available from this scheme anywhere on the system at about 1 to 2 pies per unit (0·0833 to 0·1666 pence per unit) for night supply during eight months of the year (July-February) up to a maximum of 5,000 k.w. and on a daily load-factor of 50 per cent.; after the first four to five years of operation, the storage dam of the Uhl river scheme will be constructed, and the 5,000 k.w. by-product power would from then onwards be available throughout the year. If there were sufficient inducement to start building the dam now, this by-product power would, of course, be made available throughout the year from the commencement. For a load of 5,000 k.w. at 1 to 2 pies per unit the power would be supplied at 3-phase, 50-cycles, and at any voltage to suit the consumer; for smaller loads the supply would be at, say, 11,000 or 22,000 volts.

19. To utilize this by-product power in the manufacture of ammonium sulphate, it would be necessary to install converters and other electrical plant of twice the capacity that would be required for a factory of the same outturn, but receiving a continuous supply of power throughout the day; gasometers would also be required to regulate the fluctuating production of hydrogen.

20. Gypsum occurs in enormous quantities in the Punjab in the Salt-range areas of the Jhelum, Shahpur and Mianwali districts; other important occurrences are known along the foot of the Kala Chitta range in the Rawalpindi and Attock districts, and in the Spiti Valley in the Kangra district. It also occurs in the neighbouring States of Bikanir, Narwar and Kashmir. The average annual production during 1914-18 was as follows:—

	Tons.	*Value.*
		£
The Punjab (Jhelum district)	1,389	56
Rajputana (Bikaner)	12,103	672
,, (Narwar)	5,363	247
Total	18,857	975

21. The most accessible deposits for a factory located near Lahore would be those of the Salt range, which, moreover, are in British India, about 150 miles distant by rail. I have no information regarding the distance between the railway and suitable deposits; there are two or three lines running into the Salt range, and the gypsum should be available in Lahore at about Rs.10 per ton (the transport of gypsum 150 miles at the present N.W. Railway rates would cost Rs.5-2 per ton). Some of the varieties of Salt-range gypsum are said to be very pure, but I have no analysis; it occurs in large masses and should be easy to mine.

22. There is an idea to encourage the establishment of new industries in the Punjab on lands between Lahore and Amritsar, which in time may become the industrial centre of the Province. These are the two chief towns of the Punjab, and they are only 32 miles apart; they are directly connected by the main line of the N.W. railway and by the trunk-road, and will be connected by the first instalment of the 132,000-volt trunk-line of the Punjab electricity distribution system; an adequate water supply will be available from the irrigation canals. Somewhere in this area may be found upon further investigation the most suitable site in the Punjab for a nitrogen factory; it would be well situated not only as regards electric power, gypsum, the chief market and business centres (Lahore and Amritsar) and the sugarcane districts, but also as regards labour. If the nitrogen industry were to be established in this area, and its demand for power became very big, Government could arrange to develop further

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power sites, of which there is a large number in the neighbouring Himalayas, and connect them to their system to meet any requirements of the industry, providing, if desired, a continuous supply of power (doubtless at a little higher rate). Once, therefore, the nitrogen factory is built, there would be no occasion to scrap it later on in order to move to a big power site, and moreover no capital would be required by the nitrogen company to construct power works.

23. To arrive at a rough idea of the possible future magnitude of a nitrogen industry, to meet the requirements of the Punjab sugarcane alone, we will assume that 50 per cent. of the present area under the cane is manured at the rate of 350 lb. of ammonium sulphate per acre. There are upwards of 350,000 acres under sugarcane each year in the Punjab; half this, or 175,000 acres, would consume annually 27,000 tons of ammonium sulphate, which in turn would require for its manufacture 13,500 k.w. continuous power throughout the year, or 27,000 k.w. by-product power (50 per cent. load-factor) throughout the year. The 5,000 k.w. by-product power for eight months would produce about 3,300 tons of ammonium sulphate annually; or about 5,000 tons annually, when it is made available throughout the year. The cost of electric power per ton of sulphate of ammonia produced would amount to Rs.23 to Rs.46 (with power at 1 to 2 pies per unit), or, say, 1 to 2 rupees per maund of fertilizer.

24. If the cultivator obtained an excess profit of Rs.50 per acre by the use of the fertilizer (v. paragraphs 6 and 15 above), he would almost double his present profits from the cultivation of sugarcane; this would represent an excess profit to the cultivators of the 175,000 acres of Rs. 87 lakhs annually.

25. This note is restricted to a consideration of the use of ammonium sulphate on sugarcane in the Punjab; there are very important areas, however, of sugarcane in the adjacent United Provinces, and in the adjacent States, which could be cheaply supplied from a nitrogen factory situated between Lahore and Amritsar; and of course cultivators would use the fertilizer for other crops besides sugarcane, once it is made readily available to them at low prices.

26. *Co-operative Societies.*—The Punjab is essentially a province of petty peasant proprietors—the typical cultivator owning about eight acres, and probably renting an additional four acres. The enormous difficulty that would have been experienced in supplying such an agricultural community with artificial manures, however, is practically solved by the success of the co-operative movement in the Punjab. Efforts of the co-operative organisation are said (*The Wealth and Welfare of the Punjab*, by H. Calvert, I.C.S., Registrar, Co-operative Societies, Punjab) to be resulting in an increasing demand for better seed and improved implements, enquiries coming chiefly from co-operators, who are beginning to pay greater attention to problems of land improvement and the extraction of bigger yields. A considerable amount of selected seed is now being distributed through the societies, several of which are also trying new sugarcanes with encouraging success.

27. The co-operative idea is taking firm root amongst the people; in the year 1922-23 the total number of co-operative societies in the Punjab was 9,570, with a membership of 256,363 and a total working capital of over £3,000,000. The co-operation between the co-operative and the Agricultural Departments, which is already effecting definite improvements in agricultural methods, is a matter of great importance; these two departments between them may be able to effect in time a standard of agriculture amongst the peasant cultivators of the Punjab comparable to that usually attained by wealthy farmers and planters. We should not have to wait for big farmers to replace the small farmers of the Punjab, before we could

secure a good market for artificial manures; if the Agricultural Department were to recommend now the adoption of certain artificial manures for certain crops, at prices at which we may be able to supply them to the societies, a big market might be possibly created at once. I believe the Punjab co-operative societies are financially in a position to order, if they wish, up to Rs.50 lakhs worth of artificial manures annually; there is, therefore, a big prospective consumer in existence in the Punjab wealthy enough to provide a commercial basis for the establishment of a nitrogen industry, but the Co-operative Department has to be convinced that the artificial manures (at the prices we could supply them) would be sure to bring a satisfactory excess profit to the present cultivators. No elaborate organisation has to be created for the distribution of artificial manures in the Punjab or for the propogation of the knowledge of their value; it already exists in the co-operative societies, which would become our consumers.

28. *Protection and transport.*—As Mr. Calvert has pointed out, the land-locked position of the Punjab affords valuable protection to industries based on local markets; any based on local agricultural requirements would be very favourably situated. Goods manufactured in Lahore are protected by 751 miles of freight from Karachi, 1,254 miles from Bombay, 1,213 miles from Calcutta, and about 1,070 miles from the coal mines and iron works of Bihar and Orissa. The following are the present rates for railing ammonium sulphate or saltpetre from the three chief Indian ports to Lahore:—

	Per maund.			*Per ton*		
	Rs.	*a.*	*p.*	*Rs.*	*a.*	*p.*
Calcutta to Lahore	2	10	11	73	0	2
Bombay to Lahore.	2	0	0	54	7	0
Karachi to Lahore	1	10	11	45	12	8

Sulphate of ammonia (20-21 per cent. nitrogen) at present, in wagon loads, varies from Rs.190 to Rs.200 per ton gross f.o.r. Calcutta; at the foregoing transport rate it would amount to Rs.263 to Rs.273 per ton delivered in Lahore, or about Rs.10 per maund.

27. The present rate per maund-mile for ammonium sulphate or saltpetre on the N.-W. Railway is 0·42 pie, or roughly 1 anna per ton-mile, which would be the rate for railing sulphate of ammonia from a nitrogen factory near Lahore to different parts of the Punjab.

Supplementary Note by Mr. A. T. Arnall on Nitrogen Fixation in the Punjab.

I wrote the above "Rough Note on the possibilities of manufacturing ammonium sulphate in the Punjab as a manure for sugarcane" in September 1924. I have no time at the moment to revise this note, and bring it up to date, but may add the following:—

Fixation Processes.—The processes in use for the fixation of atmospheric nitrogen may be divided into:—

(1) The arc process.
(2) The cyanamide process.
(3) The manufacture of ammonia by direct synthesis.

The *arc process* produces nitric acid from which nitrate of lime can be made. This process requires a very large amount of power in proportion to the amount of atmospheric nitrogen fixed, and has only been a commercial success in Norway, where the cost of electric power is abnormally low. The process would be quite out of the question in the Punjab, and in any case the product, viz., nitrate of lime, is not suitable.

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The *Cyanamide process* does not require any very large amount of power, but on the other hand requires good quality coke as one of its raw materials. The process is not profitable in small units and cyanamide under certain circumstances acts as a plant poison and there is a tendency for it to be superseded by other nitrogenous products. Sulphate of ammonia can be and has been produced from cyanamide, but the combined process is complicated and less economical under the conditions which we are considering than when a direct synthetic ammonia process is used.

Of the various synthetic ammonia processes, the Casale process appears to be by far the most favourable, firstly because a smaller unit can be employed economically with this process than with any other, secondly, because of the simplicity of the process and thirdly, because of the low capital cost.

The Casale process of nitrogen fixation produces anhydrous ammonia in liquid form by the combination of nitrogen and hydrogen under conditions of high pressure and temperature in the presence of a catalyst. Electric power is used for the production of pure hydrogen by the electrolysis of water. It is not used otherwise in the process except for the operation of compressors and other auxiliary machinery. As a consequence, by the provision of gasometers for the storage of the accumulated hydrogen, it is possible to arrange the load from the power stations at such hours of the day or night as may be most convenient and so reduce the power taken at times of peak load. It is, therefore, a very valuable process for the power engineer to employ in connection with the ordinary industrial or lighting load.

The synthetic plant is generally made in units to produce 7½ tons of anhydrous ammonia daily, and one such unit in operation would require 5,000 K.W. continuously for its operation. The smallest plant, therefore, that would be installed in practice would be one consisting of two such units so that one could always be in operation, the other being held in reserve in order to maintain continuous operation while catalysts were being changed, &c.

The ammonia produced would preferably be fixed as sulphate of ammonia which has been found to be the most suitable nitrogen fertilizer for sugarcane, as already indicated in the attached note. This product can be prepared either by means of sulphuric acid made from imported sulphur or pyrites or by the use of gypsum found in the locality. The gypsum process is used in Germany, and also in Spain, and I believe to a limited extent in England.

If the product is prepared by means of sulphuric acid made from imported sulphur or pyrites, a sulphuric acid plant must be put up. A complete Casale plant (including necessary sulphuric acid plant), giving an annual output of approximately 10,000 tons of ammonium sulphate, located in a convenient part of the Punjab, should be able to produce ammonium sulphate Ex Works at rather less than a Rs.150 per ton, or Rs.5—8—0 a maund, based on power costing about Rs.70 per K.W. year. In this connection, Mr. D. Milne, C.I.E., Director of Agriculture, gave me in January, 1925, the cost per ton of ammonium sulphate delivered at Lyallpur and Gurdaspur Agricultural Stations as follows:—

Year.	*Lyallpur.* Rs. a. p.	*Gurdaspur.* Rs. a. p.
1914	348 0 0	—
1915	—	345 0 0
1916	369 0 0	—
1917	—	397 8 0
1918	—	590 11 8
1919	—	560 13 4

Year.	Lyallpur.	Gurdaspur.
	Rs. a. p.	Rs. a. p.
1920	500 0 0	—
1921	500 0 0	476 4 0
1922	Discontinued	351 9 4
1923	do.	536 4 0
1924	do.	435 0 0

It will be seen from the foregoing that the price paid by the Agricultural Department is very considerably above the price that would have to be paid from a commercial plant established in the Punjab, even when using imported sulphur.

In my opinion the position fully justifies a thorough investigation of a proposal to manufacture ammonium sulphate in the Punjab by means of off-peak power from the Mandi Scheme, linked up with, if necessary, power from canal falls in the Province. This investigation should, of course, also include the possibility of utilising gypsum from the Salt Range in place of imported sulphur.

Oral Evidence.

44,402. *The Chairman*: You are Chief Engineer in the Punjab?—Yes.

44,403. You have provided the Commission with a note of the evidence that you wish to give. Would you like to make any additional statement at this stage, or may we ask you a few questions?—I have nothing further to add.

44,404. Would you tell the Commission the extent of your responsibilities? —I am Chief Engineer of the new branch of the Public Works Department that has been brought into existence to construct the Uhl river hydro-electric project which is now under construction.

44,405. And that is the limit of your present function, is it?—Yes.

44,406. What officer, if any, is responsible for reviewing hydro-electric schemes in the Punjab as a whole?—It is rather difficult to say. Government have so far not formulated any definite policy that I am aware of with that object in view, but I have succeeded in getting a Government order issued to the effect that no hydro-electric development is to be undertaken by any Government department without having the particulars of that development sent to me for examination. That has been published as an order of Government and sent to all departments in order to ensure co-ordination of the water-power resources.

44,407. From your knowledge and experience of hydro-electric development, would you say that it is a field in which it is most desirable that due consideration should be had for the future so that previous commitments may not prejudice development?—Yes.

44,408. So much from the provincial angle: Now from the All-India point of view, would you say that the same thing applies?—Yes, but not quite to the same extent, as the only contact with other Provinces in connection with hydro-electric power are the North-West Frontier Province in the north and the United Provinces in the south. The investigations of the North-West Frontier Province with regard to the water-power resources have been included in those of the Punjab, treating them as a whole. We have not made any investigations into the resources of water power in the United Provinces, but we have come in contact with that Province in connection with the proposals to extend our transmission system to supply Delhi, because at one stage there was a proposal to construct a main transmission line to Delhi via Saharanpur and Meerut and in that connection we have had to carry on some negotiations with the United Provinces.

44,409. *Sir Ganga Ram*: Was that meant for lighting purposes only?—No, for industrial power.

44,410. *The Chairman*: You have mentioned the North-West Frontier Province and the United Provinces: how about the Indian States?—Our relations with the Indian States are all carried out through the Agent to the Governor-General, Punjab States, and we have entered into agreements with two States so far, one the Mandi State, in whose territory we are actually constructing and developing our site, and with the Kapurthala State. But we have had very great difficulty in coming to any proper understanding with the States surrounding Patiala and the difficulties of negotiating agreements with Patiala State have to some extent postponed the extension of our operations in that direction.

44,411. Is there any officer directly responsible to the Government of India who is in a position to take an active and useful part in that matter? —Only the Agent to the Governor-General, who of course renders a great deal of assistance.

44,412. You are no doubt aware of the history of hydro-electric surveys in India. I think there have been three and you are probably aware that as the result of the recommendations of the Inchcape Committee the posts of the Chief Engineer of Hydro-Electric Surveys and Electrical Adviser to the Government of India were abolished in August, 1922. From the All-India angle, would you say that it is desirable that the Government of India should have some officer responsible to it for hydro-electric development as a whole in India?—I should say that it is very desirable but I am not in a position to say to what extent the questions that are arising and coming under the notice of the Government of India are sufficiently numerous or important to justify a whole-time officer.

44,413. The trouble is, of course, that rights that may be granted and vested interest that may arise may in the future stand in the way of the best use being made of the hydro-electric possibilities in the country?—Yes, I agree.

44,414. And it is difficult, unless a very close watch is kept, to prevent such commitments being entered into. Would you agree with that?—Certainly.

44,415. Now to turn to the note which you have provided to the Commission: In answer to Question 9 on page 548 you say: "There is little doubt that the availability in 1930 of cheap hydro-electric power will enable this problem to be solved by means of pumping." Is that pumping from wells?—It was not intended to be confined to wells; it was pumping either from wells or from open drainage ditches.

44,416. You have attached a series of notes to your note of evidence, dealing with the possibilities of developing the manufacture of artificial fertilizers, using electricity as the power. How far have the investigations into the economic ossibilities of these schemes been carried?—About as far as you see on the paper in front of you.

44,417. Nothing further than that?—No.

44,418. So that meantime no commercial concern would venture in this field?—I do not think so.

44,419. On page 549, you suggest that in the future fodder crops may be grown which will be consumed by the live-stock and that the waste stalks which are now eaten by the animals will be available for manufacture into fuel. Have you studied the history of fuel manufacture of that description? —No; it is merely a suggestion that occurred to me while I was drafting out the replies to the questionnaire; it occurred to me as the only feasible way of getting cheap fuel into the hands of the farmer.

44,420. On page 560, you suggest an investigation into this question of manufacturing ammonium sulphate by using your off-peak power and say that Government would be justified in embarking on a more detailed examination of its possibilities?—Yes, most distinctly. I am quite convinced of that.

44,421. Would that be an expensive venture, the survey which you suggest?—I am afraid I could not answer that.

44,422. What is to be the nature of the current to be transmitted along your main lines?—Alternate current, three phases, 50 cycles; that is the standard practice.

44,423. And at a voltage of?—I am not quite certain about that yet, probably 132,000; we are investigating that question at the moment.

44,424. What is the smallest power unit which, in your view, would, economically speaking, justify the stepping down for use with prime movers?—That is a question which we are investigating at present. In fact, the electrical industry is concentrating as a whole on this particular problem. At present the smallest economic unit is about 100 kws. and even greater but I hope that eventually we may be able to get something like 10. It is a highly technical problem upon which the best brains of the electrical industry are at present concentrated. Eventually we hope to be able to tap our transmission line with some means or other to supply every village through which we pass.

44,425. You agree that the probable extent to which current of this nature is likely to be useful to the agricultural community is the very centre of the problem?—Yes, it is; but of course you have got to remember that, even if we could step down to small units that only supply the villages through which the actual transmission line passes, which means an area about ten miles wide along the whole length of the transmission line, it does not enable us to solve the problem of how to get into districts more than ten miles away from the line. That necessitates additional branch lines at low pressure; but it is merely a matter of cost; it can be solved.

44,426. You mention the instance of California. I was thinking of the use of electrical energy by a rural population. To what use is the current put in that country by agriculturists, for power purposes?—I do not think they have used it for power purposes. Recently there have been several papers read before the Technical Institutes, and it was suggested that there were 120 uses for power on a farm, including of course ploughing, and in America nearly all those uses are taken advantage of.

44,427. Even in America the low load factor has to some extent prohibited the development in the rural areas, has it not? The amount of current used outside California in the United States by the rural population is not very important?—No; it is only at the beginning of the development, largely owing to the remoteness of the farms from the transmission line.

44,428. What is the proposal in the case of the scheme for which you are responsible, that Government should own the trunk lines?—Yes; we are building them. Our intention at present is that Government should own the whole undertaking and operate it.

44,429. Have you made up your minds as to who is going to pay for the stepping-down stations?—The trunk lines and the stepping-down stations and the distribution in the villages and towns except where licensees at present exist are to be under the Government; that is the present intention. It has been suggested that this distribution system in the towns and the villages should eventually be made over either to local authorities or distribution companies after they have been built and have been in operation for a few years.

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44,430. Would you expect electricity to take the place of bullock power to any great extent?—I think it will take the place of bullock power on a large scale. But whether it can take its place in the matter of ploughing is another matter.

44,431. Let us take pumping. Already mechanical prime movers are used for pumping water from tube wells. Do you think there is an important field for electrical development in that direction?—I think there is sufficient evidence to show that it will develop, but it will develop slowly. It is complicated by the fact that the farmer has to keep *some* bullocks, and a small man is compelled to have a pair of bullocks in any case and he could use them for pumping.

44,432. Has it occurred to you that the loss in manurial values might be an important consideration in any change of that sort?—The total amount of manure produced by two bullocks on a single farm is, I fancy, very small.

44,433. I observe from page 554 of your note that you think that the principle of irrigating land above the level of command by means of electrical power used to pump water from canals is likely to be an important direction of development in the future?—Provided the water is available in the canal. At present I understand that practically all the water that can be brought by the canals can be used up on the commanded area and that there is a shortage of water for uncommanded areas, but I am not sufficiently acquainted with this matter; that is an irrigation question.

44,434. In the main, has the case for constructing this system been founded on the assessed demand by large communities such as Lahore?—No merely large communities; it has been assessed on the total motive power actually installed in the towns which we propose to supply. There has been a very detailed census made of every motive power user and the amount of motive power he has installed, above 10 horse-power. We have not concerned ourselves with people who have motive power of less than 10 horse-power. That has been tabulated out and examined and it forms the basis of this project and a lot of that is in small towns, not large communities.

44,435. I see that you do not include the stimulation of plant growth by electrical discharges in the objects that you have in mind. That is perhaps a little futuristic?—I personally know Mr. Blackmann, and I discussed it with him when he was making his experiments in 1919, and I gathered from him that he had proved conclusively that there is a development of plant growth; but I am especially interested in selling power, and the amount of power required for this purpose is a negligible quantity; from the point of view of the salesman I am not interested in it; but from the point of view of agriculture I think it is likely to be very costly; it requires a very costly overhead system of wires.

44,436. Can you tell us how soon the first rural area in the plains may expect to have power at its disposal?—We hope to have the whole of the first stage of our system complete by April 1st, 1930. That will enable us to supply power as far as Lyallpur and also as far as Ferozepore measured from Lahore, and Ludhiana measured from Amritsar, and also, of course, in the district between Pathankote and Amritsar and also Pathankote and Mandi State, subject to the limitation imposed on us by the difficulty of stepping down from the trunk transmission line in between the bigger towns.

44,437. *Sir Henry Lawrence*: When do you expect to be able to put your power on the market?—Our goal is April 1st, 1930. We have a chart drawn up for every part of the project and charted out for the progress every month up to that date.

44,438. How much power will you be producing then?—36,000 kilowatts. We hope to be able to put that amount on the market by then.

44,439. Do you see your way to the sale of that in a short period?—We see our way to the disposal of 20,000 odd kilowatts almost at once, which will be sufficient to pay our working expenses and interest charges, but not depreciation.

44,440. What is the capital that will have been spent up to that time?—Rs.422 lakhs.

44,441. All of which is provided by Government? None is on the market?—Government so far have only borrowed from the Government of India. We use the Government of India as our banker. There have been no loans on the market; we get our money cheaper from the Government of India than we could in any other way.

44,442. When your scheme is fully developed, how much capital will it have required?—Government has only sanctioned expenditure on the first stage, which requires the Rs.422 lakhs I spoke of. If the demand for further power develops, we can develop this particular site in Mandi to a total of 118,000 kilowatt in three stages.

44,443. Between 36,000 and 118,000 kilowatts the expenditure will be very much less per unit?—Yes.

44,444. What will be the approximate cost for 118,000 kilowatts?—A little over Rs.1,000 lakhs, which includes the whole of the transmission system and distributions down to Delhi and covering the whole of the Punjab between Wazirabad and Delhi. I cannot tell you offhand the figure for the power station alone.

44,445. Is that 10 crores in addition to the first four?—No, it is 10 to 11 crores for the whole scheme for developing 118,000 kilowatts and providing a transmision system to sell it.

44,446. When do you hope to have a demand for the full 118,000 kilowatts?—We have not ventured on a forecast, but we have drawn up charts suggesting a rate of development for capital expenditure based on certain assumptions. The demand for 118,000 kilowatts is so much in the air that we have not ventured to suggest a definite time, but between twenty and thirty years would be a safe figure. If the demand for power for agricultural purposes develops, we might get that demand in ten years.

44,447. To start with, you will only be able to meet your working expenses and interest, and will be able to make no provision for depreciation?—When we sell the whole 36,000 kilowatts it will cover everything, including working expenses, interest and depreciation; but the amount we expect to be able to sell immediately is about 20,000 kilowatts, which will enable us to pay working expenses and interest. We anticipate that in five years the demand will develop for the full 36,000 kilowatts, so that at the end of five years the first stage will be fully loaded and paying its way fully.

44,448. What rate do you allow for depreciation?—On the whole project 2 per cent. on capital. That includes the cost of the tunnel and many other works which are permanent; it is practically a sinking fund. It is taken on every item separately. On some it is 5 per cent., on others 4, 3 or 2. It works out to an average of 1·9, and we have taken it at 2 on the whole thing.

44,449. What proportion of the 36,000 kilowatts is allotted for agricultural purposes?—None whatever. We did not consider ourselves justified in assuming any market for power for agricultural purposes. It was too speculative altogether. If we had done that, we might have gone in for a project twice the size, but we should have had no foundation for it.

44,450. If the agricultural demand develops, will you be able to meet it?—There will be no difficulty in doing that.

44,451. *Sir Ganga Ram*: You say with the sale of 36,000 kilowatts you will be able to cover all expenses. What rate have you considered as a

selling rate?—The selling rate for power delivered to the consumer is based on Rs.170 per kilowatt-year.

44,452. The demand will be mostly per kilowatt-hour?—That depends on the load factor of the consumer. It works out on an average to about 9·65 pies per kilowatt-hour delivered at the consumer's premises.

44,453. When the whole scheme is developed, what is the lowest rate at which you will be able to sell to the agriculturist? Three pies per kilowatt-hour?—No, never for so little as that.

44,454. With the latest form of machinery it can be generated for 2 pies?—That is for fuel charges only, but there are many other items to be considered.

44,455. Amongst the many schemes which have come before you for the use of electricity in agriculture, have you considered the American scheme for increasing the yield of crops by a network of wires?—No.

44,456. Another American scheme is for arc lights to increase the sunlight?—We have not considered that.

44,457. You have heard of these schemes?—Yes. I believe they have also a scheme for making fowls lay faster.

44,458. On page 563 of your note you say: "The synthetic plant is generally made in units to produce 7½ tons of anhydrous ammonia daily, and one such unit in operation would require 5,000 kilowatts continuously for its operation." If that is so, it will never be a paying proposition?—It does not pay to manufacture fertilisers on a small scale. You could put in a plant for 500 kilowatts, but the cost would be greater.

44,459. On the same page you give the cost per ton of ammonium sulphate delivered at Lyallpur as Rs.348. I do not think that is correct?—That refers to 1914. These were figures given to Mr. Arnold by Mr. Milne.

44,460. His information is not correct; it can now be obtained for Rs.5 to Rs.6 a hundredweight in Lyallpur?—I will make a note of that.

44,461. You refer also to pyrites. Have you found any source of iron pyrites in this country?—No, we only know of gypsum.

44,462. I am told there is a deposit in Gwalior. Have you heard of that?—No.

44,463. I do not understand what you mean on page 549 when you say: "It is possible that fodder crops grown to take the place of the waste stalks now eaten by animals would not only improve the quality of the livestock but would release this waste to be compressed by machinery into cakes of convenient size and weight for fuel purposes"?—I understand that a large amount of wastage off the crop is eaten by the cattle now, and they excrete it in the form of manure which is made into cakes and burned. I suggest you might burn it before it is eaten.

44,464. You refer to *bhusa* and so on?—Yes, chopped maize stalks and that kind of thing.

44,465. *Sir Thomas Middleton*: To what points do your main transmission lines radiate from Mandi?—There is a trunk line through Amritsar which terminates at Lahore. From that we have three branches in the first stage: from Lahore to Lyallpur, from Lahore to Ferozepore and from Amritsar back to Ludhiana.

44,466. The voltage of the main trunk line is 133,000?—Yes.

44,467. What about the secondary lines?—66,000.

44,468. These secondary lines will be traversing agricultural country. What would be the cost of transforming down to 400 volts or thereabouts?—I have not the exact figure, but it would be very much less than from the main line.

44,469. The cost of transformers is very considerable at the present time?—It goes up as the square of the voltage, so that with a high voltage it is very costly. With medium voltages it is not very expensive.

44,470. For stepping down from 33,000 to 400, would a single transformer cost from £200 to £400?—Yes, but this depends on the size.

44,471. I understood you to say to the Chairman that the best brains in the electrical world were being concentrated on this subject at the present time?—Yes, to produce a cheap small transformer for high voltages.

44,472. The cost of the transformer is the main difficulty in utilising electricity for agricultural purposes?—Yes.

44,473. I think you know that Sweden is the European country which has done most in the application of electricity to agriculture. Do you happen to know why it is that such progress has been made in Sweden?—Because the Swedish peasant is very much better educated as to the uses of motive power on the farm and he has taken it up very much more readily; if it were taken up as readily out here, we should be able to do the same thing.

44,474. How was he induced to take it up? That is the point. It was not altogether a question of intelligence. Was it not because Swedish producers of electricity sold the excess load at very cheap rates to induce the farmer to take it up?—I cannot give you first-hand evidence to that effect, but I think that is true. I know the manager of the Swedish concern; I discussed various questions with him, but I did not ask him that question and so I cannot tell you.

44,475. That is what happened. I see that, in the estimate made for the production of synthetic ammonia, a figure of from 1 to 2 pies per kilowatt hour is quoted as being the possible price to be charged for power?—Excess power costs us nothing; by-product power costs us nothing.

44,476. Is there any prospect of your being in a position to supply power at that price for agricultural purposes?—Provided we can ensure being able to switch it off at our own convenience, and that is rather difficult to do when it is spread out amongst a number of small consumers; when you get one big man like this taking 5,000 kilowatts, you can have an arrangement by which you can cut him off and you know he is cut off; but it is rather difficult to ensure that when dealing with a number of small people spread over a large area.

44,477. At present the agricultural applications in view are pumping, sugar mills, mills for rice and wheat grinding, and that class of stationary machinery. Do any others occur to you?—We had long discussions about two years ago which we tried to summarise in those notes which we gave you. As far as I can recollect, we came to the conclusion that, outside pumping, in this Province at present there was very little likelihood of getting any market for power on the farm.

44,478. But if by producing sulphate of ammonia at a cheap rate you largely increase the sugar crop, there will be a good deal more crushing to do?—Yes, if we could concentrate the crushing into factories, then I think that would give us a market.

44,479. But even the small three-roller mill could utilise electricity?—Yes, but it is spread about so much over the country and the load is so small at each point, that it does not justify the network of transmission lines to supply the power at those points; if you could concentrate it at the factory, we could take a single line to the factory.

44,480. Is this Casale process to which you refer being much worked at present on the Continent?—It is in use satisfactorily, I believe, in Italy.

44,481. Has it displaced the Haber process to any extent?—No, I do not think so, because it is a new process and has only been developed in Italy for a few years.

44,482. *Professor Gangulee*: It is a post-war development?—Yes, it is entirely post-war.

44,483. *Sir Thomas Middleton*: I think it originated in France?—I could not tell you.

44,484. It is a patented process?—Yes.

44,485. You can only work under patents?—Yes.

44,486. I assume there would be no difficulty in arriving at an arrangement; has this point been gone into?—We have not gone into it, but the man who wrote this paper for me was employed by Dr. Crowley in London for some years, and as a matter of fact, he wrote this note when he was in the employment of Dr. Crowley; I believe Dr. Crowley has organised a syndicate in London which has obtained the patent rights for the development of the Casale process I think in the British Empire; I am not absolutely *au fait* with all the particulars.

44,487. *Professor Gangulee*: Have you worked out the details of the Casale process?—No, nothing more than you see in the paper.

44,488. So that you could not tell us whether it would be advisable for the State to undertake the manufacture or subsidise such undertakings?—No, it is that very inquiry we are asking you to do; we are suggesting an inquiry to ascertain that.

44,489. You are waiting for the demand for the fertiliser before you start making it; is that the position?—Yes.

44,490. You can create the demand by producing cheap fertilisers?—The two must go together; we must have a certain minimum demand before we can start.

44,491. The sale of nitrogenous fertilisers is increasing in India as a whole?—I believe so.

44,492. So that that is an indication that there would be a growing and steady market in India for nitrogenous fertilisers?—Yes, we think there is sufficient market already, or there very shortly will be, owing to the development of the Agricultural Department. We think there probably would be sufficient market, but the matter has to be investigated by experts.

44,493. Sufficient market to justify the Government in undertaking such a scheme as the Casale process?—Yes; if not to undertake, to subsidise it.

44,494. *Mr. Roberts*: With reference to paragraph 24 of your note, on page 561, any profit you may get from selling ammonium sulphate will depend on your manure being cheaper than the imported manure, or in other words, the difference between yours and the imported in price?—Yes.

44,495. This is merely an indication of what is possible in the future?—Yes.

44,496. Do you think it would help if we were to recommend a subsidy now in anticipation of this demand, and that we should try supplying manure at a cheap price, say, Rs.8 a maund, on a fairly large scale? Do you think that would help at all in the next two or three years?—Yes, I think that is a splendid suggestion.

44,497. At present other manures like nitrate are being supplied, but not very much sulphate as far as I know?—Yes.

44,498. These firms are pushing their produce a good deal; I was wondering whether you have any views on the point?—We have not thought

out any procedure to try and develop the market, but any suggestion like that is worth consideration; we could subsidise imported manures until such time as we are able to replace them, and then stop the subsidy.

44,499. *Sir Henry Lawrence*: What area is served by the first stage of your scheme?—I cannot give it in square miles, but I can show it on the map; it is serving 22 towns included on a line from Mandi to Pathankot, from Panthankot to Amritsar, from Amritsar to Lahore, and on to Lyallpur, with a strip down to Ferozepore and another strip to Ludhiana and the towns that occur actually on these routes, with one or two small diversions such as Tarn Taran below Amritsar, a few miles away; that is the area.

44,500. The figure you mentioned to Sir Ganga Ram, 9.6 pies, is for the supply in bulk?—No, that is the supply to the individual mill-owner.

44,501. Down to what minimum?—That is the average of all the supply down to 10 h.p.

44,502. When you bring your power into Lahore, do you then sell it to the existing Lahore Company?—That is the present proposal because that is a town in which there is a licensee at present operating.

44,503. On what sort of rate would you be supplying?—That is the subject of negotiations which are in hand at the present moment, but we hope to be able to sell it to them in a big bulk supply concentrated at one point at a figure which may work out eventually at about 5 or 6 pies.

44,504. About the same as the supply in Bombay?—Much the same.

44,505. *The Chairman*: Have there been any indications of a demand from the Railway Companies for power for traction?—The North Western Railway employed Messrs. Merz and Maclellan about six years ago to give them a report on the possibilities of electrifying certain sections of their line. That was based upon steam. Since then they have not taken any step towards investigating the possibility or desirability of electrifying those sections upon water power except the Kalka-Simla Railway where, at my suggestion, they had an investigation carried out about three years ago; I was one of a Committee that worked out a report on the subject.

44,506. It is the case, is it not, that as a rule water carried by canals is not capable of providing power? But is it your view that in future construction canal falls might be designed with an eye to power purposes, without prejudice to their primary purpose?—Yes, I have been advocating that for the last twelve years.

44,507. Do you think your words have fallen on willing ears?—They are beginning to bear fruit at present I think, e.g., in the designs of the headworks at Suleimanke; for the new headworks now being built I supplied them with designs for the foundations and masonry work for a two-turbine station which would use water falling from the river into the canal; that has actually been provided and they can now put in those turbines at a later date if they want to do so without any special extra expenses; for masonry work that is the only case I know of where it has actually been done.

44,508. *Sir Henry Lawrence*: Have you communicated those designs to the engineers of the Sukkur Barrage?—No, I have never been asked to. I simply got out the designs and made a present of them to Mr. Smith, who was the Superintending Engineer in charge; it was purely unofficial on my part.

44,509. *Sir Ganga Ram*: Your Kangra railway has not been electrified?—No.

44,510. Are they still keeping to steam?—Yes.

44,511. Can you say why?—No, I cannot.

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44,512. Your transmission lines will run parallel?—I had better tell the history of it. The Kangra Valley Railway was originally got out by ourselves as part of our own project; we realised that it was a very long way from the coal field; we had a surplus of electric power available; we realised that although the traffic in the first ten years might not be sufficient to justify electrification at once, it was almost inevitable that that line would be electrified eventually. We located the line with steep grades with a view to eventual electrification. The project was taken over by the North Western Railway and they have located it as a steam railway with a much flatter grade. The Punjab Government is at present under agreement to pay them a subsidy for thirteen years amounting to a maximum of four lakhs a year to cover the cost of operating the line. The line will be operated by steam.

44,513. Do you know what the weight of rail is? How many tons per yard are they putting in?—They are I believe putting in 60 lb. rails.

44,514. And they have not considered the possibility of working that line by ordinary motor power?—No.

44,515. *The Chairman*: Is there any journal published in India to which you could have communicated the idea embodied in the scheme for using falls on canals for power which you have just mentioned?—Yes, there are two or three engineering journals in India.

44,516. Is there any irrigational journal?—No; but there is a journal published annually containing the papers read before the Engineering Congress in Lahore which has been very useful in that particular way.

44,517. Have you had the chance of sending any contribution of that sort to any of the official agricultural journals?—No.

44,518. The provision of power lift at extremely cheap rates is of very distinct agricultural interest, is it not?—Yes; I advocated the design of canal falls in the first place with a view to power development as far back as 1914 in a paper which was read at the Engineering Congress at Lahore in order to encourage the development of artificial fertilizers and since then the only canal system that has been built is the one known as the Sutlej Valley Project.

44,519. You will see my point: the stimulus for the construction of such a scheme would probably come from the cultivator who wants the water, rather than from the Irrigation officer who as long as he can sell the water and make his scheme a financial success does not usually concern himself with anything else?—Yes; what we hope to do is to develop all the best falls eventually and link them up and have complete system of thirty or forty stations, and then they can be shut down one at a time without anybody knowing anything about it.

(The witness withdrew.)

Dewan Bahadur RAJA NARAINDRA NATH, M.A., M.L.C., Lahore.

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION.—(v) The main incentive is to get a Government post.

(vi) Yes, but the agricultural classes in the Punjab mean agricultural castes. I am of opinion that preference for admission to agricultural colleges and schools should be given in the following order:—

1. Landowners* whose principal source of income is land and who reside on the land.
2. Landowners who, though not residing on their land, depend mainly on land, or whose principal source of income is land.
3. Others.

(x) In connection with this I may put forward, for consideration of the Commission, a scheme which will not only relieve unemployment, but will popularise agriculture and introduce a series of object lessons in improved methods of agriculture, and husbandry to the more ignorant and illiterate land owners and tenants.

I would set apart a large area of Crown lands, specially those on the new systems of canals about to be opened, for small grants not exceeding two squares each to persons who previously owned no land but who had received education in an agricultural college. The minimum standard of agricultural education required should be a six months' course such as that now meant for land agents and managers. Land should be given on twenty years' lease, the lease in no case to be renewed in favour of the person who has once held it, the object being only to give a start in life. Residence on land should be compulsory and an essential condition of the lease, a breach of which will involve forfeiture of leasehold rights. Assessment on the land should not be higher than on neighbouring land not held on the above terms. Improved methods of agriculture should not in these leasehold lands be more highly assessed on the ground that they yield a higher net profit. Proprietary rights should never be granted, for otherwise the benefit of the chance will be limited to a small number. Those who already own land should be excluded from the benefit of the scheme, for they should utilise their knowledge on land which they already possess. The lease should terminate on the death of the lessee and it should be inalienable. No compensation should be granted to the lessee at the end of the period of the lease, after which the land would revert to the State. *Taccavi* in a suitable amount may be granted to start the work.

A number of agricultural colleges and schools will have to be opened.

QUESTION 4.—ADMINISTRATION.—(c) (iii) These need a great deal of improvement; most of them are unfit for rapid transport vehicles. District Boards should be empowered to levy an extra cess for improvement of communications, as also for other beneficiary improvements, such as sanitation, medical relief, veterinary dispensaries.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(c) In the Punjab the right of mortgage and sale is already restricted by the Land Alienation Act. The right should be restricted further. The Act operates in two ways. It restricts the right of alienation and it gives a preferential right for the acquisition of land by purchase or mortgage to wealthier individuals in the same class. The time has come when, while the restrictive aspect may be maintained in respect of the poorer or the more ignorant classes, the richer and the better educated classes who do not need restriction but who benefit

*Witness prefers the phrase "sons of parents." See reply to Question 44,571.

by the privilege which the Act confers should be exempted from the operation of the Act under Section 24; for instance, I would exempt the following classes from the operation of the Act.

1. Men who have taken to Government service or to professions such as the law, or medicine or teaching.
2. Government pensioners drawing a pension of more than Rs.100 per month.
3. *Jagirdars* in receipt of *Jagirs* of more than Rs.1,000 a year.
4. Persons who pay more income tax than land revenue.
5. All ex-members of Provincial or Imperial Cabinets.

Some agricultural classes have taken to moneylending and yet they enjoy the privilege of a preferential acquisition of land. The whole subject needs a thorough enquiry, with a view to carrying the principles of the Act to their logical and legitimate conclusion and to prevent the expropriation of poorer and more ignorant owners by the richer and the better educated rural middle class which has come into existence within the last 25 years.

QUESTION 8.—IRRIGATION.—(a) (iii) Encouragement should be given to the utilisation of subsoil water in all irrigated tracts. Tube wells would be useful in reducing the chances of waterlogging and in promoting intensive cultivation. Encouragement can be given in two ways:—

1. By giving long protective leases for tube wells, for I am not sure if the principle of return of capital within the period of protection will justify longer protection in the case of tube wells. Sinking of tube wells requires larger capital; on the other hand, a larger area is commanded by tube wells than by ordinary wells.
2. By not curtailing the supply of canal water already given to the land; for, if an owner is deprived of a certain volume of canal water after he has arranged for an additional supply, he will not spend any money in procuring the additional supply. It may be noted that on every canal system only a part of the commanded area is irrigated. For the part which is not irrigated or commanded, wells will be useful.

QUESTION 9.—SOILS.—(a) (ii) As far as I know, the reclamation of alkali lands can be best effected by allowing water to stand in the fields for a time and repeating the process from year to year. This method of reclamation should be encouraged and the Irrigation Department should supply more water for *usar* land where the department is satisfied that a part of the supply is used for reclamation of such lands. I would further reduce the charge of water so used to half its present rate.

QUESTION 10.—FERTILISERS.—(f) Any method other than that of spreading education and knowledge or propaganda against such practice would prove inquisitorial. Village panchayats where they exist should use their influence.

QUESTION 13.—CROP PROTECTION, INTERNAL AND EXTERNAL.—(c) The subject of pests and the methods of their destruction need further investigation. Our knowledge of pests is very incomplete, and still less is known of such practical methods of destruction as can be adopted without large, and sometimes prohibitive, expenditure.

QUESTION 15.—VETERINARY.—(b) (i) No. Here also the difficulty is one of funds. District Boards have not sufficient funds unless they are authorised to levy additional cess.

QUESTION 16.—ANIMAL HUSBANDRY.—(a) I am of opinion that an average cultivator, especially in irrigated tracts, has hardly any spare time if he devotes himself properly to husbandry. My experience is that the tenant who takes to dairy farming or keeps a number of milch cattle is a bad

cultivator. He is keen on sowing fodder crops but does not work hard enough on other crops, most of which he spoils by allowing weeds to grow which can be used as fodder. Cottage industry would be harmful to husbandry and would make cultivators lazy and disinclined to bear the hardships of the weather in open fields.

(c) Poultry rearing requires a regard for cleanliness which the average cultivator does not possess. Superior class poultry is liable to many diseases and the average cultivator has not the requisite knowledge of medicine and hygiene.

Only landowners owning large areas grow orchards, which give a slow return. Bad roads and inaccessibility of markets are also an obstacle, as is the insufficient supply of water in many places.

Government should certainly start model factories for utilisation of rice straw for paper or crude alcohol. At present, rice straw is simply thrown away; but, of course, unless communications are improved and facilities afforded for transport of the manufactured article, no industries in places remote from the railways can flourish. In conclusion, I may say that want of intelligence and education is the real obstacle in the way of agricultural improvements. Want of intelligence, or, what is called in psychology, representative faculty, and consequent lack of energy makes the agricultural classes incapable of realising the advantages of prospective improvements They are unwilling to spend the small amount of money which they can afford, for they are unable to visualize the prospective advantages.

Oral Evidence.

44,520. *The Chairman*: Dewan Bahadur Raja Naraindra Nath, you are a member of the Legislative Council?—Yes.

44,521. You have provided us with a note of the evidence which you would like to give before the Commission. Is there anything in addition to that which you wish to say at this stage?—I have nothing further to add.

44,522. You say the subject of pests and the method of their destruction need further investigation. I suppose it is true that many agricultural problems need further investigation. What draws your attention to this one in particular?—I have found the destruction of pests to be a very difficult problem, because I have failed so far in my attempts to grapple with this problem, whereas in other matters I have met with at any rate a certain measure of success.

44,523. Is it your point that you have not been completely successful in this matter?—Yes.

44,524. I see on page 574, in answer to our Question 2 (x), you suggest setting apart a large area of Crown lands, specially those on the new systems of canals, for small grants not exceeding two squares each to persons who previously owned no land but who had received education in an agricultural college. Are you thinking there of a young man who has had no practical experience in farming?—I assume that he will have got that practical experience in the school.

44,525. He gets the technical training no doubt, but I should like to have your view as to whether he gets experience in management and in the commercial side of farming at the College?—I do not assume that he will have sufficient experience so far as the management or commercial side of the question is concerned.

44,526. Do you think that an ideal course in the college will equip him to manage the farm successfully the day he leaves college?—Yes, with the help of his common sense.

44,527. I think you are depending a little too much on the common sense of a young man who has not been brought up to the business of management by his father because it is very difficult to give practical training on the commercial side of farming in an institution such as a college?—Yes, but that difficulty he would experience in any career of life; if he were to take to trade or commerce, he would certainly need practical experience even there.

44,528. I think that in most cases, after a young man has received his technical training, he gets a little more practical experience before he begins on his own, does he not?—He can obtain that amount of practical experience from his neighbours by talking to his friends and so on. I think that is not a difficulty which is likely to handicap him materially. After all, in every practical career we lack practical experience and we only pick it up in the course of practical work.

44,529. On page 574, sub-section (c), your suggestion, I take it, is that there should be some change in the law as it affects the right of District Boards to levy taxes: is that your idea?—Yes; in fact a bill of this kind is about to be introduced in the Council.

44,530. Meantime is it the case that District Boards are not empowered to levy any extra cesses or rates for the specific purpose of roads?—No.

44,531. And your desire is that they should be equipped with the necessary power?—Yes.

44,532. With regard to Question 8, you suggest that encouragement should be given to cultivators to use tube wells by avoiding any curtailment in the supply of canal water. Is it the case that where a cultivator farms land commanded by a canal and where that cultivator sinks a tube well, the canal water is deliberately cut off?—I have no practical experience but I think that they do discriminate between land commanded by canal only and land on which there are wells, and when any area is commanded by wells they are not very generous in supplying canal water.

44,533. You suggest on page 575 in your answer to our Question 9 (a) (ii), that the reclamation of alkali lands can best be effected by allowing water to stand in the fields for a time and repeating the process from year to year. Have you any personal experience of this method?—Yes.

44,534. Has it proved successful?—Yes.

44,535. It is possible in the case of the soil you are thinking of to wash the salt down into the sub-soil?—Yes.

44,536. Has that to be done every year?—It has to be done for a couple of years and then gradually the sowing of crops is begun.

44,537. I see from your remarks on pages 575-6 that it is your view that the average cultivator, especially in the irrigated areas, has hardly any spare time for other spheres if he devotes himself properly to husbandry?—Yes.

44,538. Is that view founded on any exact observations?—In my own lands I find that whenever they begin keeping milch cows they devote more attention to fodder than to other crops and when they are close to the city they take to plying bullock carts.

44,539. Would you deplore any expansion of the area in the Punjab under fodder crops and the keeping of more milch cows?—As one owning land and not keeping a dairy farm I do regret it, but if I had had a dairy farm, I would not regret it.

44,540. Why do you regret it?—Because fodder crops do not bring in as large an amount of money as the superior crops.

44,541. Would you agree that a due proportion in the diet of the cultivator of milk and *ghi* is absolutely necessary if the population is to be

vigorous?—Yes; he might have it for his own use, but he generally brings it to the market and sells it there.

44,542. Is your land leased on the system of *batai*?—Yes.

44,543. How do you arrange with your cultivator when you have that particular system of rental and he grows fodder crops and goes in for dairy farming?—I levy a small cash rent.

44,544. But you find that you do not get as much as a landlord would expect to get?—No, especially in the case of *rabi* crops. *Moth* is a fodder crop which is very much resorted to by my tenants, and I levy a very small rent.

44,545. Why do your tenants turn from arable to pastoral activities?—Because it pays them more; I do not get a share of the milk that they sell; in other words I cannot share their profits in dairy farming.

44,546. That is not possible, is it?—No.

44,547. Do they pay you as high a cash rent for land used for dairy farming as they do in fact pay in kind in *batai*?—No, they do not; nor have I devised any system by which I can get as much as I would otherwise have got.

44,548. Are any steps available to you to discourage the spread of dairy farming? Have any ideas occurred to your mind in that direction?—I have not put into actual practice any such ideas, but I can put a limit to the area which they bring under fodder crops.

44,549. In your lease?—Yes.

44,550. Have you ever inserted that in any lease?—No.

44,551. Do you have any binding clauses in a lease of that sort covering such matters as cropping?—I have very old tenants with whom verbal arrangements are made, and I therefore do not get any bond executed. I just depend on their word of honour; it is a purely mutual arrangement.

44,552. Then you suggest that cottage industries would be harmful to husbandry and would make cultivators lazy and disinclined to bear the hardships of the weather in open fields?—That is my opinion; I think, myself, that these cottage industries about which there is so much talk will tend to detract from the time that the cultivator would devote to agriculture and husbandry.

44,553. But surely where cottage industries are taken up they employ a man, not in the time which, before they were taken up, he spent on hard work in the field, but in the spare time which he is accustomed to fritter away in idle argument or even in gambling; is that not the idea?—It is an idea which does not work well in practice. I find that the cultivator is not as energetic as he might be. He does not work as hard as one might expect him to work. But of course all tenants are not alike in this respect. Some are hard working and some are not. Those who work hard get very good crops and derive good profit. Perhaps 50 per cent. of them are lazy, and if they find means of some occupation, means of earning money remaining at home and inside their houses, they will be disinclined to do the hard work which cultivation involves. It may sound paradoxical, but that is my opinion.

44,554. Do you notice any change in the characteristics of the cultivator during the period that you know?—Yes, he has become a little more lazy; he is more inclined to be a rent-receiver than an actual cultivator.

44,555. *Sir James MacKenna*: I understand that you were a Deputy-Commissioner in the Punjab?—Yes, I was.

44,556. Had you any agricultural stations in your district when you were Deputy-Commissioner?—No. I retired ten years ago and the Department of Agriculture was just beginning to assume a shape.

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44,557. Were there ayn co-operative societies at that time?—Yes, there were co-operative societies.

44,558. What attitude do you think the Deputy Commissioner should take up towards the co-operative movement or in agricultural matters?—I think he should adopt a sympathetic attitude.

44,559. Did you do it yourself when you were Deputy Commissioner?—So far as co-operative societies were concerned, I examined the records of the societies, held conversations with people, and recognised the good work done by them.

44,560. *Mr. Calvert*: You are still a member of two co-operative societies, are you not?—Yes, I am.

44,561. *Sir James MacKenna*: I see on page 576 you say: "Government should certainly start model factories for utilisation of rice straw for paper or crude alcohol." Why do you particularly select rice straw for paper and crude alcohol?—Because no use is made of it now, except that it is considered to be a very inferior fodder which brings in nothing either to the landowner or to the tenant.

44,562. What reason have you to believe that paper pulp or crude alcohol manufacture from rice straw is a feasible proposition?—I have no personal knowledge in this matter. Paper is suggested in the question itself, and I read somewhere that crude alcohol can be manufactured out of rice straw. I personally do not know how far it will succeed.

44,563. *Professor Gangulee*: Do you know the Lyallpur Agricultural College intimately?—I had been there once on a visit just to see the College, but that was about eight or nine years ago.

44,564. You have not visited the place recently?—No.

44,565. You suggest a certain preferential treatment for admission to the Agricultural College. Do you know what principle is now followed in the admission of students?—As far as I know, admission is based on caste and preference is given to students belonging to the agricultural tribes. I suggest that admission might be given to all who are actually interested in the land; because, a man belonging to the agricultural tribe may, after all, not have any interest in agriculture; he may be a barrister or a doctor; on the other hand, one who does not belong to the agricultural tribes may have a great interest in agriculture.

44,566. The College does not debar any non-agriculturists?—It does not, but it gives preference to people who belong to the agricultural tribes.

44,566. You say that the number of colleges and schools should be increased?—Yes, if my scheme is accepted.

44,568. You think there would be more demand for agricultural education if your scheme were adopted?—Yes.

44,569. With regard to the Land Alienation Act, you suggest that certain classes should be exempted from the operation of the Act. Could you amplify your reasons for holding that view?—I have given my reasons in my note. Under the present conditions the peasant proprietor is exposed to expropriation by the more intelligent classes of his own tribe. If restriction of the right of sale and mortgage is a useful thing, it ought to be enforced not only against the men who belong to non-agricultural tribes but also against those who belong to the agricultural tribes. I have also mentioned the classes which, in my opinion, ought to be exempted. These are the classes that have dissociated themselves altogether from agriculture and have nothing to do with agriculture, and yet have got the preferential right of acquisition, which simply exposes the peasant proprietor to expropriation. I say the restriction should be enforceable against all.

44,570. Do you think that the Act has in any way fostered the growth of the agriculturist moneylender?—I do not think that it has had the direct result of creating that class; but the agriculturist moneylender has come to the surface by the ordinary operation of economic laws. He has earned some money, become more intelligent and more educated, and invests it in moneylending.

44,571. *Mr. Calvert*: When you mention "landowner" in relation to the admission to agricultural colleges, you are not stressing the ownership of land, are you?—I should have said "sons of parents whose principal source of income is land"; that would be a better way of expressing it.

44,572. You want to take tenants, too, to the Agricultural College—Yes. I want that the admission to these colleges and schools should be widened.

44,573. You do contemplate people who own no land going to the college?—Yes, I do.

44,574. With regard to the Land Alienation Act, would you like the twenty years' limit on mortgages to be extended to all mortgages even though they are between people of the agricultural classes?—Yes.

44,575. At present, a zamindar cannot mortgage his land for more than twenty years to a non-zamindar, but he can to a zamindar?—It is a much wider question than the one to which I have directed my attention. What I wish to impress upon the Commission is that there is no reason why these men belonging to these classes which I have enumerated in my note (the list is by no means exhaustive) should have a preferential right of acquiring land. Government can take action under Section 24.

44,576. Have you interested yourself in the question of dairying near Lahore?—I have heard something about the dairy farms, but I have not taken any interest myself.

44,577. Do you think the Lahore people will be willing to pay a higher price for pure milk?—They will pay a higher price for pure milk than for bad milk.

44,578. At present the clients of these high-grade dairies consist of British officers and a few educated Indians?—Yes, because the better-class people who can afford to pay a higher price generally keep their own milch cattle. One finds a milch cow in the house of almost every respectable Indian; that is why he does not buy dairy milk.

44,579. Has there been a large increase in the demand by Indian gentlemen for dairy products such as cream, cheese and butter?—For butter and cream there has; I am not sure about cheese.

44,580. *Mr. Kamat*: What is your opinion of the policy carried on by Government in this Province in regard to allotting Crown waste lands on canals? Do they give the bulk of the area to capitalists and men of wealth and less to men of moderate means? Is their policy in your opinion correct?

44,581. *Mr. Calvert*: They do not *give* it to capitalists?—There ought to be some area given to capitalists, because capitalists introduce agricultural improvements, but the rights of peasantry and men whose holdings have been reduced to very small dimensions through sub-division by inheritance should receive consideration, and also men who have lost land by riverine action and so on.

44,582. *Mr. Kamat*: I am not asking you what should be done; I am asking you as an ex-Deputy Commissioner whether the policy so far pursued has been just and fair to men of moderate means?—The policy of giving land to capitalists was adopted with regard to the area on the Lower Chenab canal and some of the area on the Upper Chenab, but it has not been pursued since. In 1897 and 1898 there were capitalist and yeoman grants

on the Lower Chenab canal. People did not come forward in sufficient numbers even for those yeoman grants at that time, and it was to give an incentive to colonisation that these capitalist grants were introduced. They have not been continued on other canals.

44,583. Is land now being concentrated in the hands of those who have made money out of irrigated land, or is the distribution fair, considering the general population of this Province?—Naturally all the land sold by auction goes to those who can command money, and usually to those who have made money out of land.

44,584. So the wealthy are growing wealthier?—Yes, that is the general rule in every country. The cry of the wealthier classes nowadays is that more attention is being paid to the poorer classes.

44,585. Are those men who have received large grants of land along the canals taking agricultural graduates as apprentices on their holdings so that these graduates may have an opportunity of learning the business side of agriculture?—No, I do not know of a case of that sort. The reason is that for the management of land it is not only scientific knowledge which is required; it is capacity to manage and honesty, which cannot be guaranteed in the case of graduates fresh from college.

44,586. I do not think you have understood my question. Are these big grantees who have got land from Government and who have become wealthy encouraging poor graduates fresh from college by giving them an opportunity of coming as *apprentices* to learn business management?—No. My point is that they are not doing this on account of the difficulties I mention.

44,587. What are the difficulties?—That these men may have scientific knowledge, but they may not be good managers or honest men.

44,588. As to not having scientific knowledge, when apprentices are taken by a business concern they are known to be raw men; that is why they are called apprentices?—No one, moreover, will work without payment; no graduates will come forward unless they are paid.

44,489. Are the grantees as a class offering opportunities to college graduates?—No.

44,590. The point is therefore one which requires some consideration on the part of the grantees?—And also on the part of the college graduates. Will the graduates undertake to work as apprentices?

44,591. I suggest that is a direction where the grantees can come to the help of their educated countrymen?—Yes, if there are educated men from the college who are willing to utilise the opportunity.

44,592. *Mr. Roberts*: With regard to your suggestion for giving land to men who have had some agricultural training, the two squares you suggest would be worth about Rs.1,000 per annum, would they not?—Yes.

44,593. Nearly Rs.100 a month?—Yes.

44,594. These men you recommend would have had only six months' training?—Yes. That is the minimum, of course.

44,595. Most of them would not have had more?—That is so.

44,596. Are you aware Government can employ these men at Rs.30 to Rs.50, which is the pay of the *muqaddams* who have been trained in this manner?—But they will be only servants.

44,597. I merely wish to draw your attention to the cost of your proposal. I think it would fall to the ground on that basis?—You think that the minimum educational requirement is much too low?

44,598. Yes, it will cost too much for a man who has had only six months' training?—You may have men with three years' training as applicants.

44,599. That would be less objectionable?—I mentioned six months as the minimum on which I would insist.

44,600. How is your own land managed?—I have got land in three places. One is managed by a very old manager of mine, whose father was in my service and who is a very intelligent man with a good knowledge of agriculture. Another place is managed by a man who has only just entered my service, and who was formerly employed on a farm under Government. The third is managed by a man in whose honesty and ability I have complete trust. He has had no college training, but I think he is the best of the lot so far as knowledge of agriculture, managing ability and honesty are concerned.

44,601. You have not employed any graduates from the Agricultural College?—No.

44,602. *Sir Thomas Middleton*: Your first point is that the subject of pests and the methods of destroying them requires investigation. Have you in mind specific instances of damage done by pests to your own property or that of your neighbours?—Yes. For instance, no satisfactory remedy has been found for the insect we call *tela*, which does a great deal of harm to mango trees. There are tracts in the neighbourhood of Lahore where the mango trees have been greatly damaged by these insects. I tried one remedy in my orchard and it proved successful, but when tried elsewhere it has failed. There is also an insect we call *gandheri* which damages the cotton crop; we suffered from that last year. The only remedy for that I have heard suggested is that children should be employed to pick the insects off the crop and destroy them, but the cost of employing children for that purpose would be prohibitive.

44,603. Your point is that the crops of yourself and your neighbours suffer from pests for which you do not know remedies?—Yes.

(The witness withdrew.)

The Commission then adjourned till Saturday, 5th March, 1927, at 11 a.m.

Saturday, March 5th, 1927.

LAHORE.

PRESENT :

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E. M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., M.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc. } *Co-opted-Members.*

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } *Joint Secretaries.*

Mr. M. L. DARLING, I.C.S., Commissioner of Income Tax, Punjab and N.W.F.P., Lahore.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—This is a matter for experts, but it may be mentioned that the eight experimental stations maintained by the Italian Government do not attempt to cover the whole agricultural field, but specialise in certain crops, thus:—

Rome	Wheat
Rieti	
Velletri	Vines
Avellino	
Conegliano	
Bargamo	Maize
Vercelli	Rice
Rovigo	Sugar Beet, Poultry.

It might be worth considering whether better results would not be obtained if the same system were introduced in India side by side with the present.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—My views are given in my article on "The Cattedre Ambulanti of Italy and the Training of the Peasant." (See page 594 below.)

QUESTION 5.—FINANCE.—Short-term credit should be provided by co-operative credit societies and long-term credit by land mortgage banks. For my views on co-operative finance please see my reply to Question 22.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) The main causes of borrowing are summarised on page 251 of my book "The Punjab Peasant," and are as follows:*

"There are four main reasons why the peasant proprietor is obliged to borrow:—

1. The small size of his holding and the way it is split up, conditions which make it almost impossible for him to live without getting into debt, unless he is exceptionally frugal and industrious, or has some extraneous source of income;

* "The Punjab Peasant in Prosperity and Debt." Oxford University Press, 1925.

2. His constantly recurring losses of cattle from drought and disease;
3. His ingrained improvidence, the effects of which are greatly aggravated by insecurity of crop; and,
4. His extravagant expenditure upon marriage and other domestic ceremonies.

In addition there are two causes that make borrowing easy, namely:—

1. The money-lender and his vicious system of business; and.
2. The great expansion of credit due to high prices and the inflated value of land.

The first four causes explain why the peasant proprietor must borrow, the last two how he can borrow, and it is the combination of "must" and "can" that explains the great increase of debt in the last fifty years. Or, expressing it differently, we may say that the first four causes explain the existence of debt, the money-lender and his system, its continuance, and the expansion of credit, its volume.

Two minor points must also be noted: litigation, though a serious factor in certain districts, is not a major cause of debt; and land revenue, though often a cause of borrowing, is rarely a cause of indebtedness.

(ii) For the sources of credit, please see chapter x of the same book.*

(iii) The reasons preventing repayment embrace the whole life of the peasant and may perhaps be summed up as follows:—

(1) the profound insecurity of life and crop in India acting upon very small holdings (for the effect of this see page 266 of my book);

(2) the thriftless character of the peasant which various forms of legal protection do nothing to mitigate;

(3) the character of the village moneylender, which is such that it is considered almost a virtue to outwit, and sometimes even to murder, him;

(4) the limited field of investment open to him which makes him reluctant to press for the return of his money, provided interest is more or less regularly paid;

(5) the heavy interest charges and their rapid accumulation in bad seasons at compound interest;

(6) the prodigal expenditure upon marriages leading to large unproductive loans which can only be repaid with difficulty.

(*b*) Co-operation is much the best *direct* means of lightening the burden of debt, as the following figures show, relating to 2,093 village banks in the Punjab (with 69,000 members) which have completed 10 years. One hundred and twenty-eight lakhs (£850,000) of debt have been repaid, 38,000 acres redeemed and 41,000 taken in mortgage or purchased for 87 lakhs. Fifty-eight lakhs have been accumulated in shares and undistributed profits, and 35 per cent. of the members are entirely free of debt. In other words, liabilities have been reduced by 128 lakhs, and assets increased by 145 lakhs. The former represents an average reduction of Rs.185 per member. As there are over 300,000 members of village banks in the Punjab, this means that co-operation is reducing debt at the rate of about six crores (£4 million) in ten years.

The best *indirect* means of combating usury is the development of communications, education and joint stock banks. In the Punjab, usury is most evident in the more backward districts, e.g., Attock, Muzaffargarh and Gurgaon, and least evident in the more developed districts, e.g., Lyallpur. Emigration is another means and has been singularly successful in southern Italy (see para. headed "Sub-division of Holdings" in the passage on Agricultural Progress already forwarded). It would probably be only less effective in the Punjab if doors now closed could be opened; in Jullundur, for instance, it has had marked effect. But this is presumably impossible. A note on the present position of moneylenders is attached. (See page 592.)

* "The Punjab Peasant in Prosperity and Debt." Oxford University Press, 1925.

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(*c*) In the Punjab, the Land Alienation Act restricts mortgage and sale. Circumstances have changed so profoundly since the Act was passed that, in my opinion, it requires reconsideration. It was primarily passed to protect the weaker cultivator from expropriation, and in this it has succeeded. But it no longer merely protects the weak, but confers a very valuable privilege upon the strong; for, with the great increase in rural prosperity, many agriculturists are now in a position to buy land, and, as purchasers, are placed in a privileged position by the Act. The conferment of a privilege is obviously much less defensible than the conferment of protection. The difficulty is to grant the one without the other. Some advocate the introduction of a Homestead Law making whatever area is necessary to support a family inalienable. Such laws are in force in America, and several countries in Europe, e.g., France, Germany, Switzerland and Roumania, but they do not always prove effective, and as recently as 1920 a Commission reported against their introduction into Italy.* In Roumania there is not only a Homestead Law, but also a law that no more than a prescribed amount of land may be acquired. The object of this is to prevent the swelling of large estates at the expense of small.

For my views on certain aspects of the Land Alienation Act please see pages 187-90 and 230 of my book.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) The question of excessive sub-division of holdings is discussed in the passage on Agricultural Progress already quoted.

(*b*) Consolidation on a large scale can, in my opinion, only be effected by legislation.

QUESTION 10.—FERTILISERS.—(*f*) In 1919 an attempt was made to get trees planted by certain co-operative societies in the districts of Gurdaspur and Hoshiapur with a view to increasing the supply of wood for use as fuel in place of cow-dung. The Presidents of two Banking Unions each gave a *kanal* of land for nurseries. Both plots were sown with *shisham* seeds. Two thousand three hundred eucalyptus trees were also distributed, and one village planted its waste land with 400 *dhak* trees (Co-operative Societies Report, 1919, pp. 3 and 13). As I left the Co-operative Department in 1920, I am unable to say whether the experiment succeeded. But I rather think that it failed owing to the difficulty of getting the young trees properly looked after. An experiment of this kind might be more successful now.

QUESTION 11.—CROPS.—(ii) I have said something about the importance of fodder crops in what I have written about agricultural progress (see paragraph on Intensive Farming,† and also in my article on "The Training of the Peasant" (see paragraph on La Battaglia di grano).‡ The success of mixed farming would appear to depend to a large extent on the development of fodder crops. The difficulty, I am informed, is water. If so, it is an argument for the more economical use of water.

Another difficulty is the size of holding. An Italian expert informed me that he doubted whether it was possible to have a scientific rotation on a holding of less than 7½ acres, as the small holder likes to play for safety and grow his own food. If, for instance, he puts all his land under one or two crops, e.g., potatoes or beans, which fail, he is unable to buy the wheat and maize he requires. He therefore grows both every year. In the Punjab a very large number of holdings are less than 7½ acres. Moreover, they are so fragmented that a scientific rotation is impossible.

QUESTION 14.—IMPLEMENTS.—(*a*) Please see page 179 of my book. Labour-saving implements, &c., are required to only a very limited extent in a country in which employment has to be found for vast masses of labour.

* Serpieri Op. cit p. 132. † See page 606. ‡ See page 597.

Enquiry, which has already collected much interesting information. The Board, however, suffers from two drawbacks, which, as its work expands, are becoming increasingly evident. Its investigators are entirely untrained, and its members have too little leisure properly to check and sift the work done under their supervision. If the Board is to extend its field—and it can hardly avoid doing so—and if it is to collect reliable information, both points will have to be remedied. They are, indeed, under consideration at present. Sooner or later, too, a paid secretary will have to be engaged. The Board has been exceptionally fortunate in its present Honorary Secretary, Professor W. H. Myles, whose ability and enthusiasm have enabled him successfully to cope with the ever-increasing burden of work. But there is a limit to what even the most enthusiastic Honorary Secretary can do, and that limit has nearly been reached.

2. When I was working at the International Institute of Agriculture at Rome, I was able to discuss the question of economic enquiries with three American experts, Professor A. Hobson, formerly employed in the Bureau of Farm Management, U.S.A., and now American delegate to the Institute, Mr. L. M. Esterbrook, formerly head of the Bureau of Crop Estimates, U.S.A., and now in charge of the World Agricultural Census, and Professor Dwight Sanderson, Professor of Rural and Social Organization, New York State College of Agriculture, Cornell University. All three were strongly of opinion that economic and statistical enquiries, to be of real use, should be done by trained investigators. Professor Sanderson's opinion was of special value, as he had personally supervised various economic enquiries. During the last fifteen years Cornell University has collected records of about 7,000 farmers' family budgets. The work has been done almost entirely by graduates, mostly working for their M.A. and for a doctor's degree. Undergraduates are rarely employed, but are frequently attached to graduates for training, so that when they take their degree they may be ready for employment. An interesting point is that most of the 7,000 records relate to farmers who do not keep accounts. Farmers, said Mr. Esterbrook, have often such accurate memories that the absence of accounts is not necessarily a serious drawback. Errors, of course, occur, but with a large number of cases tend to cancel each other.

3. Intensive enquiries are preferred to extensive as being more accurate, and it was agreed that enquiries made over a large area should always be supplemented by detailed enquiries in different parts of the area. The drawback of the intensive method was that it was slower and more expensive.

4. As the United States admittedly leads in the field of economic enquiries in rural areas, it may be of interest to give a brief account of its organization. This I am able to do thanks to Messrs. Esterbrook and Hobson, who gave me the information which follows. Till 1921 there were three Bureaux, viz.:—

(*a*) the Bureau of Crop Estimates,
(*b*) the Bureau of Farm Management, and
(*c*) the Bureau of Markets.

In 1921, they were combined into the Bureau of Agricultural Economics as a branch of the Federal Department of Agriculture. Something will be said about each Bureau in turn.

5. *The Bureau of Crop Estimates.*—In every State there is a State statistician under the Federal Government who collects crop estimates from as many different sources as possible and checks them by constant touring. In every county—there are altogether 3,000—there are 60 reporters who report once a month on the condition of the crops and livestock, and there are also 33,000 township reporters. A township, it should be explained, is not a town but a sub-division of a county, presumably something like an English parish. Then there are about 20,000 "Field-aids" who report occasionally, and special reporters who report on special crops (e.g., sugar) or

subjects (e.g., elevators). Altogether there are about 220,000 reporters, all honorary, and about 75 per cent. farmers. The remainder are officials, dealers in agricultural exports, railway traffic men, &c. If a questionnaire is sent out, 60 per cent. will probably reply, but great care is taken not to send out too many questionnaires to the same reporter.

6. *The Bureau of Farm Management* deals with farming as a business, analysing costs, e.g., of production, transport, cattle breeding, &c. A large number of enumerators are employed, nearly all graduates, and carefully trained in economic enquiries. Starting on 1,800 dollars per annum, they rise to 4,000; some even to 6,500. If necessary, accountants are provided to keep the accounts of farmers from whom detailed information is required. One accountant can work for a good many farmers, as he is given a car. Mr. Esterbrook said that this Bureau, which has been working for over twenty years, has achieved very valuable results.

7. *The Bureau of Markets* was organized in 1913 to facilitate the sale of produce which had become difficult owing to over-production. Its first object was to standardize production. It has already succeeded in doing this for cotton, and its grades are so well established that cotton can be sold on certificate instead of by sample. Similarly, its wool standards are accepted by Bradford and the chief wool markets in Germany and France. It is now doing the same for wheat. This has always been graded by the dealers, but the Bureau is trying to teach the farmer to grade it himself before sale. Bonded warehouses have been established under federal inspection where all kinds of farm produce can be stored. When stored, the produce is graded, and a certificate of quantity and quality issued. This certificate is negotiable at a bank which advances against it.

Further information about the Bureau will be found in the account of the Agricultural Department given in the Annual Congressional Directory.

8. Of the need for some organization of this kind there can, I think, be no doubt. Most Governments are at last feeling the necessity of formulating an agrarian programme, and are realizing that this cannot be satisfactorily done without accurate information as to rural conditions. This explains the Board of Economic Enquiry in the Punjab and the Bureau for Economic and Statistical enquiry (Instituto di Economia e Statistica Agraria) recently created in Italy with Professor Serpieri at the head of its Managing Committee. In Italy, it is also proposed that every large agricultural administrative area should have its experimental Institute, that each Institute should have a Bureau for economic and statistical enquiry, and that all the Bureaux should be co-ordinated by the Central Insitute at Rome.* But it remains to be seen whether anything will come of this. In Italy schemes have a way of not getting beyond the paper stage.

APPENDIX II.

Memorandum on the International Institute of Agriculture, Rome.

I have ventured to write the following note on the International Institute of Agriculture at Rome, as I have close personal acquaintance with it and its relations with India are one of the subjects for discussion at the agricultural conference to be held at Pusa next month.

2. The three main objects of the Institute are, firstly, to collect and collate the experience of as many countries as possible in regard to agriculture and co-operation and to place this experience at the service of its members; secondly, to give the latest available information as to the condition of the more important crops in different parts of the world; and thirdly, to offer facilities for the study of agricultural and co-operative questions.

* International Review of Agricultural Economics, March, 1925, p. 91.

of State favours after the war was largely responsible for the growth of a very unhealthy type of co-operation.*

(*b*) As to the different types of society, I have nothing to add to what I have written in my "Report on Co-operation in Germany and Italy." A point, however, that I would emphasize—and it applies to all types—is the importance of giving the individual co-operator instruction in the elements of co-operation. No co-operative organization can be strong without this.

QUESTION 23.—EDUCATION.—I have touched on this in my article on "The Training of the Peasant," page 598. The problem of making rural education a vivifying instead of a disintegrating factor in the village is the most difficult of all our rural problems. With most other problems the difficulty lies not in finding the remedy but in applying it, for the remedy is known. But in this case the remedy has still to be found. The Punjab is probably on the right track with its rural training schools at Ghakhar and Gurgaon, but this experiment should probably be supplemented by careful study (on the spot) of what has been done in Europe and Japan.

QUESTION 24.—ATTRACTING CAPITAL.—(*a*) The Land Alienation Act is an obvious obstacle to men of capital and enterprise taking to agriculture.

(*b*) An effort should be made to get the larger landlords to realize their obligation to give a lead on their own estates in the matter of agricultural improvement, vide the passage on "Agricultural Progress" already quoted. At present there are very few landlords who do anything at all. This is one of the crying needs of the Province, and if not remedied, may ultimately lead to a demand for such measures as have recently been passed against the landlord in the Balkan States and in Poland.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*b*) In 1919, with the help of a Government scholarship holder, I carried out a general survey in twelve villages in Hoshiapur and Gurdaspur Districts. Since then much more detailed and elaborate surveys have been carried out in a number of villages in the Punjab by the Board of Economic Enquiry. I consider that such enquiries, if properly carried out, are likely to yield very useful results. As the question of economic enquiries is an important one, I attach a separate note on the subject.

In conclusion, I would sound a note of warning against forcing the pace in any direction. Agricultural development depends primarily upon research and education. (In education I include propaganda, demonstration and training.) Both require time, the former to establish its conclusions, the latter to train its teachers. In India the personal factor has quite unusual importance, and if the organization required for agricultural development is not to become an incubus upon the countryside, great care will have to be taken in selecting and training the men who are to deal with the cultivator.

APPENDIX I.

ECONOMIC ENQUIRIES.

A precise and accurate knowledge of the real conditions of the small cultivating proprietor, says Professor Serpieri, is essential to an effective agrarian policy.† That this knowledge is not available in India is not surprising, for it is available in very few countries. In Italy statistical economic enquiries are still at their first step (*ai primi passi*)‡, and in France official agricultural statistics are described as "defective, inexact and out of date."§ The Punjab is, therefore, to be congratulated on having a Board of Economic

* Serpieri, Op. cit., p. 237.
† Per la Piccola Proprieta Rurale e Montana, 1922, ii. 231.
‡ Serpieri, La Politica Agraria in Italia, 1925, p. 144.
§ Laribe, Evolution de la France Agricole, 1912, p. 100.

3. The utility of the first and last of these three objects depends upon whether the experience of other countries is likely to be of value to India. My own experience, gained not merely from books, but from personal contact with the agriculturist, both in India and in Europe, convinces me that the agricultural problems of one country cannot be satisfactorily solved, and scarcely even understood, without some knowledge of what has been done in other countries. If this is so, it is a strong argument for establishing the closest possible ties with an institution like the International Institute.

4. As to the utility of its second object, I am not qualified to judge, but I would note that more than one business firm in India pays for crop reports to be sent to it by the Institute, which suggests that the information given has commercial value.

5. The means by which the Institute seeks to give effect to its three objects are as follows, viz.:—

(*a*) disseminating information on points of general interest through its publications and crop reports;

(*b*) giving detailed information in reply to specific inquiries; and

(*c*) maintaining a large library for the study of agriculture and co-operation.

6. Nothing need be said about (*a*), as the publications and crop reports speak for themselves. As to (*b*), the Institute is always prepared to give the fullest possible information on any point referred to it. With the increasing interest taken in agriculture and co-operation in India, and with a more systematic effort to develop them, many questions are bound to arise upon which information as to the experience of other countries is likely to be useful. At present, however, comparatively little advantage is taken of this facility.

7. The same consideration applies with even greater force to (*c*). So far only two or three students have come from India to work in the library of the Institute. Yet the facilities which it offers for the study of agriculture and co-operation are almost unique. With its 50,000 books, 50,000 publications, and 70,000 volumes of magazines, it is the second* largest agricultural library in the world and the largest in Europe†. In addition, 3,500 periodicals and bulletins are taken in, so that up-to-date information on every aspect of rural economics is readily available.

8. Enough has perhaps been said to show that the Institute has real advantages to offer to India in the solution of her many most difficult agricultural problems. The question is how the fullest possible use can be made of these advantages. In my opinion the first step is for India to be represented at the Institute by a delegate familiar with Indian conditions and Indian administration. In common with the rest of the British Empire, India was represented up to the time of his death by a distinguished retired Home Civilian, Sir Thomas Elliott, Bt., K.C.B.,‡ who had never been in India, so that, in the circumstances, India was unable to derive the fullest possible benefit from the Institute was inevitable. Sir Thomas Elliott, with whom I had had the advantage of discussing the subject, was in favour of the change and authorised me to say that personally he would welcome it.

9. If India had her own representative, he would be able to develop to her advantage each of the facilities mentioned in paragraph 5 above. Thus, in regard to (*a*), he would secure that the publications of the Institute

* The largest is that of the Department of Agriculture at Washington.

† The only one that rivals it in Europe is that of the Agricultural School at Wageningen in Holland.

‡ Now replaced, I understand, by Mr. Thompson of the Board of Agriculture, who, however, does not reside in Rome.

dealt from time to time with the problems in which India was specially interested.

In regard to (*b*), he would see that the information sent in reply to a specific inquiry was such as was likely to be useful; and, being intimate with Indian conditions, he would no doubt be able to indicate the points of special applicability to India and to place them in their proper perspective. At present, for want of local knowledge, there is a danger of irrelevant or superfluous information being sent in reply to an inquiry. Thirdly, in regard to (*c*), he would be able to assist students from India in their studies; and, if he were himself well versed in the practice and theory of rural economics and *au fait* with its literature, his advice would be of considerable value, as would also be his opinion on any point referred from India.

10. Further, he would be able to keep in touch with the Directors of Agriculture and Registrars of Co-operative Societies all over India in a way that is impossible for a person who has not been an Indian official.

11. Finally, he would be able to secure full expression of India's standpoint in the administration of the Institute and in the application of its funds. This is a point of some importance in view of the economic inquiries which the Institute contemplates initiating in different parts of the world.

12. I am inclined to think that the delegate will require an assistant, for if, as is probable, requests for information become frequent, it will be difficult for one man single-handed to examine and report upon a large number of different questions; nor will he have time for the reading which is essential if his opinion and advice are to be of value. With an assistant, too, a wider field of literature can be covered, if, in making the appointments, regard is had to the importance of a knowledge of languages. The delegate must in any case know French, as the proceedings of the Committee are conducted in that language; and if, as is desirable, he also knows Italian, and his assistant is familiar with German, it should be possible to keep in touch with all the more important economic developments in Europe and America.

13. In conclusion, I would note that Belgium, Holland, Norway and Finland all maintain delegates at the Institute. In the circumstances it seems surprising that India with its 220 millions dependent upon agriculture is only indirectly represented.

Supplementary Note.

I continued working at the Institute for six weeks after writing my note of the 26th October, 1925, and found that further experience only served to confirm earlier impressions. There was no doubt then that, for all practical purposes, the Institute was completely out of touch with India, a fact that was generally recognised at the Institute itself and at the same time genuinely deplored. To remedy this the first step, in my opinion, is for India to obtain direct representation on the Committee of the Institute and to appoint as her delegate or representative a man well versed in the literature of rural economics and able to speak French. If he can also read Italian or German, so much the better.

2. Now that there is a flow of officials and others to Europe to study agricultural problems, a representative of this type might be of great use in advising courses of study and planning tours of inquiry. I myself should have been able to map out my time to better advantage had there been someone at the Institute familiar with Indian conditions and rural economics to guide my reading. And on an earlier occasion, in 1920-21, when I was put

on deputation to study the co-operative movement in Europe, I should have found practical advice as to where I should go of great help. As it was, I had to discover everything for myself, thereby wasting much time in preliminary enquiries. There are other ways, of course, in which a representative could be of use. These have been specified in my first note and need not be repeated.

3. Another point to which I would draw attention is that, for want of funds, the staff of the Institute is paid so badly that it is difficult to obtain the services of good men. This applies particularly to the English staff. For instance, in 1925, the most important member of the latter was, I believe, paid only 3,000 lira a month, then equivalent to £300 a year; his salary too had only recently been raised. The remedy is for India to press for a revision of salaries and to offer to increase her contribution for the purpose. In 1925, I understand, the latter amounted to only £800. Considering the overwhelming importance of agriculture to the bulk of India's millions, the amount is almost negligible.

4. In conclusion, it may be said that if India means to achieve agricultural progress, she will be well advised to take the fullest possible advantage of the experience of countries that have had to tackle, or are still tackling, the same problems as those with which she is confronted. To enable her to do this, a link is clearly required with the outside world. This link already exists in the Institute, but at present it hangs idly and is but little used.

APPENDIX III.

The Present Position of the Village Moneylender in the Punjab.

I have just received reports from all the Income-tax Officers in the Punjab regarding the present position of the village moneylender in the Province. With only two exceptions, all agree that the village *sowcar* or professional moneylender is gradually reducing his business in the village. The Gurdaspur report goes so far as to say that he "is fast approaching the verge of extinction." The two exceptions are Hissar and Montgomery. In Hissar, he is still in a very strong position owing to the great insecurity of harvest which most people cannot tide over without his help. And in Montgomery he finds ample scope as the rapid development of the district—it contains an important young colony—has set up a brisk demand for capital. But even in Hissar it is said that he has begun to feel that the times are against him. There is no doubt as to this. His short-lived supremacy, a matter of fifty years, is gone, and now, though not yet broken, he is, in my opinion, doomed. For this there are various reasons, but the most obvious are the following:—

(*a*) the rapid growth of co-operative credit societies;
(*b*) the legal protection given to the peasant borrower; and
(*c*) the rise of the agriculturist moneylender.

2. Little need be said about (*a*) for it is self-evident. In only three districts (excluding Simla) are there less than 200 credit societies, and in eight there are over 500. Last year 183 lakhs were advanced by village banks to their members, and it is a curious coincidence that this too was the amount upon which the rural moneylender was taxed. This does not mean, of course, that the total income of the latter was only 183 lakhs, as only those with an income of Rs.2,000 or more are taxed. The figure shows that the credit society is now seriously encroaching upon the domain of the moneylender.

3. As to (*b*), the agriculturist cannot now be evicted by a civil court without the intervention of the revenue authority; his plough cattle, implements

and seed cannot be attached; if he is sued, interest charges can be examined and, if necessary, reduced; and when he dies, his ancestral land is not liable for the payment of his debts unless they are charged upon it. These privileges have almost the effect of a cactus hedge round the smallholder and his holding, and make recovery for the *sowcar* extremely difficult. Till the War, the cultivator did not realise the strength of his position and took but little advantage of it, but since the War his eyes have been opened, and in all but the remoter districts he knows he can outwit the *sowcar* if he wants to, and often he does. Once the spoilt child of Government, the *sowcar* has become its stepchild. And it is not only Government that he feels is against him, but the whole rural Muhammadan community as well. Where, as in Karnal, communal feeling is strong, his position is particularly difficult, and he is said to be leaving the villages where the Muhammadan Ranghar and Moghal are dominant. Karnal is one of his strongholds; yet from this district comes the story of a *sowcar* who, having realised all he could from his debtors, asked the Income-tax Officer to have the amount deposited with the local Central Bank, explaining that if the bank would take care of his money, he would be able to earn more by manual labour. Ten years ago such a story would have been impossible.

4. A number of the reports before me speak of the tendency of the *sowcar* to migrate from the village to the town. The Lyallpur report states that the Sikh and Arain villages of the colony have been deserted by all but the smaller fry. In the older colony areas, the tendency is to leave the village for the *Mandi* or local market town and start a commission shop there. Though the interest rates in urban business are much lower than in rural, recovery is much more certain, for not only can house property be attached but the townsman has far more moveable property than the villager. And, recovery being much more certain, the moneylender has not constantly to be pursuing the evasive or recalcitrant debtor.

5. There is one gap in the cactus hedge round the cultivator, and that a serious one, namely, the gap made by the rise of the agriculturist moneylender. I have dealt with him at length in my book (vide pp. 228-31), and all that it is necessary to add is that, though few reports speak of any marked increase in his numbers, all agree, with the exception of Amritsar,* that he is steadily advancing, especially in the central districts, where the Sikh Jat, the arch-representative of the type, predominates. This year—the assessment is not quite finished—about 400 have been taxed; that is to say, this number has been found to have an income of Rs.2,000 or more. Relatively, no doubt, this is a small figure, but it must be remembered that in village money-lending a taxable income implies a capital of at least Rs.12,000. Few agriculturists have this amount to spare, but hundreds, probably even thousands, lend smaller sums.

6. Though the tide has definitely turned against the *sowcar*, it has not yet ebbed very far, and rural money-lending is still the most important industry in the Province. This is shown by the following income-tax figures, which relate to 1925-26:—

Chief sources of Income and Super-tax.	*Lakhs.*
Business:—	
(*a*) rural banking	5·60
(*b*) urban banking	4·07
(*c*) trade in agricultural produce	4·82
(*d*) piece goods	3·14
(*e*) contracts	1·72
(*f*) legal business	1·61
(*g*) timber	·92

* And Jhelum, see Question 44,605.

	Lakhs.
Industry:—	
(*a*) ginning factories	4·26
(*b*) oil mills	1·24
Miscellaneous:—	
(*a*) salaries (income-tax only)	12·51
(*b*) house property (income-tax only)	4·62
(*c*) interest on securities	1·69

It will be seen that there is only one head of tax which is more productive than rural money-lending, viz., salaries. Excluding salary cases, one out of every four assessees is a rural moneylender, and, even including them, the proportion is one to five. The stronghold of the rural moneylender would appear to be the south-eastern Punjab. In three out of the four districts which make up this area, namely, Karnal, Rohtak and Gurgaon, more than half the total number of assessees are rural moneylenders, and in the fourth, Hissar, the proportion is more than one-third.

7. In my book I wrote that "the peasant proprietor can hardly pay less than 15 per cent. on his debt" (p. 218). This estimate has been criticised as being too low. It is interesting, therefore, to note that after careful enquiry extending over the whole Province, 15 per cent. is now the commonest rate applied to income-tax cases when for want of proper accounts the village moneylender's income has to be estimated by the application of a flat rate to his capital on loan. The rate naturally varies from area to area, but almost everywhere it oscillates between a minimum of 12 and a maximum of 18 per cent. Only in Gurgaon does the latter go up to 24 per cent. It must not, of course, be supposed that, apart from Gurgaon, 18 per cent. is the maximum rate charged in the Punjab. All that is to be inferred is that 18 per cent. is the maximum that can fairly be taken as an average rate for a large area. The corresponding rates for urban money-lending are 6 to 12 per cent., the commonest rate applied being 9 or 10. Broadly, therefore, it may be said that rural rates of interest are twice as high as urban. The difference between the two is the measure of the difference in risk between the two classes of business.

8. A final word may be said about the moneylender's accounts, as it shows how primitive the moneylending system is in this country, and incidentally how difficult it is to tax the moneylender correctly. This year, out of every three rural moneylenders assessed—the total number is about 5,200—only one produced accounts that could be relied upon, while one produced no accounts at all. No doubt the latter often keeps some kind of account, but it is generally reported that a great many agriculturist moneylenders keep no account at all and rely entirely upon their bonds and pro-notes.

APPENDIX IV.

The Cattedra Ambulanti of Italy and the Training of the Peasant.

It was, I think, Pope Julius II who remarked that men are more influenced by what they see than by what they hear. The cinema suggests that this is true of the mass of mankind. It is certainly true of the uneducated mind, of which a good example is the *tongawala* who, when he hears the horn of a car coming up behind, invariably looks round before getting out of the way to see if the car is really there. To the same category belongs the peasant. In him lack of education is intensified by a singularly concrete outlook upon life which makes it difficult for him to understand a new idea or even a fact unless it is put before him in some visible tangible form. And he has suffered so much in the past from men quicker-witted than himself that he is deeply mistrustful of all who come

before him with new nostrums. To persuade him, therefore, to change a traditional method, it is necessary to demonstrate not only that the new method is possible but also that it pays. Even in the United States, where nearly all can read and write, it is said that "though hundreds of millions of pages of literature have been distributed (amongst the farmers), only a small percentage has actually been read, and only a small percentage of that read has been put into practice."* Two thousand "country-agents" are now maintained in the States to act as a link between the experimental farm and the individual farmer, and we read that "the success of the continental and still more of the United States educational work is largely due to the provision which has been made for bringing down to the farm the information obtained by investigation and research."† All authorities are, in fact, agreed that demonstration is the most effective way of teaching the peasant; and, since it is becoming increasingly clear that this applies to India, some account of the Italian organization known as the *Cattedra Ambulanti*, of which I had the good fortune to see something in the winter of 1925, may be of interest, especially as the problems of the Italian countryside have much in common with those of the Indian.

Organization.

Cattedra Ambulante means literally an itinerating chair, the last word being used in the academic sense of a chair of history or philosophy. The first Chair was created in 1896, and thirty years later, at the beginning of 1926, there were over 100. It was then proposed to double the number in furtherance of Mussolini's campaign to improve the wheat supply of the country commonly called "*la battaglia di grano.*" Each of Italy's 71 districts (Provincia) has at least one Chair, and many have branches in the larger country towns. The district of Rome, for instance, had ten in 1925, and in the whole country there were 304. Every office is in charge of a director, and, if a headquarter office, there are two or three assistants as well. The combined staff totals nearly 500 men, most of whom have taken the highest possible diploma in agriculture.

The first point to emphasize is that a *Cattedra Ambulante* is not an official body. The earliest were the product of spontaneous local effort unassisted by Government. A District Board combined with the local People's Bank and landowners' association, and between them the £250 or £300 a year required to start a Chair were found. Before the war few had a budget of more than £500. It was not till the movement was launched that Government gave any help, nor till after the war that it bore the major part of the cost. In 1919 a substantial grant was made and divided equally between all the Chairs. But this equality of treatment proved most unequal in operation, as districts varied in size and Chairs in activity. Since 1923 the grants made by Government and local bodies have been proportioned to needs on the following basis:—One lira for every 25 acres of cultivation within the Chair's area; half a lira for every 25 acres of wood, meadow and pasture; another half lira for every rural inhabitant; 100 lira for every commune or village area; 16 for every mile of communications, and 10 for every sub-division of a commuen (*frazione*). The total grant was £140,000, of which three-fifths are contributed by the State and two-fifths by the District Boards.‡ Both parties are represented on the managing committee of each Chair, Government by one member and the District Board

*C.M.D. 2145 Memo. xi.

†C.M.D. 2145, Memo. xi, paras. 165, 170 (4).

‡In this article all post-war payments have been converted from lira into sterling at 120 lira to the pound, which was the approximate rate of exchange in the winter of 1925.

by from three to five. To strengthen their organization and co-ordinate their work, the Chairs have federated themselves into a "Union" with a Director General as the chief executive authority. To meet its expenses, the Union is allotted 2 per cent. of the amount contributed by Government and 1 per cent. of the amount contributed by District Boards; the former is paid direct and the latter by each Chair from its own grant.

Functions.

The sole object of a *Cattedra Ambulante* is the encouragement of better farming. This it does in a number of different ways, most of them based upon some form of demonstration. The simplest, and perhaps the most effective, is the demonstration plot. As in the Punjab, where in 1917 the writer was the first to introduce the method, an intelligent owner is persuaded to cultivate from two to three acres of his land on approved methods in order to demonstrate to the neighbourhood their superiority over traditional practice. In 1925 there were as many as 50 in the single district of Rome, of which 20 were devoted to the culture of fruit. In addition to demonstration plots, large gatherings of cultivators are organised to discuss the problems of the district, and conferences of a dozen or twenty to consider how these problems can be solved. Farmers are encouraged to consult the staff about their individual problems, and if advice is needed about seed, cattle or corn, it is promptly given. If necessary, the farm itself is visited, and this is not difficult, as every Chair has at least one motor car. A farmer comes into the office in the morning to say that he is in difficulties with a horse or a cow, and the same afternoon, with the help of the car, horse or cow can be examined and treatment prescribed. Only less important than the car are the magic lantern and the cinema. These are both freely used in the educational courses described below.

The Cattedra Ambulante of Siena.

Three Chairs were visited, and the best of the three, that at Siena, will be described at length, as it shows how a good Chair is run. The Chair at Rome will also be referred to, but the third shall be nameless, as it had run to seed under the influence of a director without either capacity or enthusiasm. The success of a Chair depends almost entirely upon the personal factor, as is always the case when initiative, enterprise and tact are required rather than a strict adherence to rule and routine. This is a point to be remembered if the organization is copied in India.

The town of Siena, famous for its Cathedral, its saint and its horse races, is the capital of a hilly district situated in the heart of Central Italy. The cultivator is prosperous as holdings are large, averaging from 20 to 25 acres where cultivation is based upon the vine and the olive, and fifty acres where it is based upon cereals. To the Punjab peasant with his 5 or 10 acres these will seem generous figures, but they are not quite as generous as they seem, for the soil produces only one crop a year and in some parts is so hard that virgin land has to be broken up by explosives. Even where the vine and the olive are cultivated, from 15 to 20 acres are required to maintain the small proprietor and his family in comfort, and from 35 to 40 where cereals prevail. In the more mountainous parts of the district many have less than five acres, and are obliged to do other work to make both ends meet. The famous *metayer* system, under which both expenditure and income are shared by landlord and tenant, is common, but since the war, which has enriched the peasant, many tenants have become proprietors. The peasants are now so well off that the Monte dei Paschi, a well-known local bank, which for the last 300 years has been run for the common good of the district, is now mainly supported by their deposits. Fortunately, prosperity has not had the corrupting influence that it has had in some

parts of the Punjab. The peasant spends his money well, and it is only when he lives in the neighbourhood of a town that he is a little extravagant. The proportion of illiterate, 30 to 35 per cent., is greater than one would expect in the northern half of the peninsula. But literacy beyond making a farmer quicker to pick up a new method, is said to have very little effect upon cultivation.

Founded in 1901, the Siena Chair is staffed at headquarters by a director, an assistant and a cattle expert. There are two out-stations each in charge of a director, and for propaganda on special subjects specialists are temporarily engaged. The annual budget amounts to £2,200, contributed in varying proportions by Government, the local District Board, the 36 communes of the district and a number of co-operative societies. There are in addition special grants, which in 1925 were as follows:— £525 for technical education, mostly for boys; £350 for the rearing of good live-stock,—high-class pigs had been obtained from Regio Emilia and a good breed of sheep from the Roman Campagna; and £2,200 for the "battaglia di grano" to be spent upon demonstration plots, prizes, concessions, and the maintenance of an agent in each commune, etc. £700 of this came from Government, and the rest from the District Board, the local landowners' association, the district co-operative supply society and the Monte dei Paschi. Total resources, therefore, in 1925 amounted to over £5,000, a considerable sum when it is remembered that the population of the district is less than 400,000. But the Chair was not always so prosperous. It began operations with an income of only £300 subscribed by Government, the District Board, the Monte dei Paschi, the municipality of Siena and the local agricultural association. The director was paid £160 a year and his assistant £80. This did not leave much for the work of the Chair, and there was much to be done, for many obstacles had to be overcome. Landowners were apathetic and generally absentee; their factors were hostile, and the peasants sunk in ignorance. The first step, as my informant expressed it, was to awaken "the rural conscience." This was done by talking to the peasant on his farm, explaining things to small groups of those who were anxious to improve their position and demonstrating new methods. A more general appeal was made by local conferences, of which as many as fifty were sometimes held in a year, and by offering prizes of from five to twenty pounds to be competed for by the more enterprising farmers. That these efforts have succeeded may be shown by a single example. In 1902, the year after the Chair was created, only 650 tons of chemical fertilizers were sold by the local Supply Society; by 1924 the amount had risen to nearly 20,000, and a year later, thanks to the "*battaglia di grano*," to close on 30,000.

La Battaglia di Grano.

A word may be said in passing about this "battle of the grain," as Mussolini's intensive campaign for increasing the wheat supply of the country is characteristically called. The campaign has been launched, as large quantities of wheat have to be imported every year, and it is believed that, if Italy could manage to grow all the wheat she requires, imports and exports would balance and the lira, long in danger, would be saved. To India the experiment is of some interest, as it will show whether in a country not entirely dissimilar it is possible by organised effort substantially to increase the yield of a staple crop in a comparatively short space of time. In Siena, the peasant is being urged to put not more, but less land under wheat. The explanation of this paradox is worth noting. Hitherto the customary rotation has been beetroot or tobacco, wheat and clover sown together, followed by clover alone, and finally wheat. The ideal holding was one divided into four parts each representing a different stage in the

four-fold rotation. Now it is proposed to divide it into five parts, cultivated thus:

Beetroot or tobacco	...	...	...	one-fifth.
Wheat and lucerne	...	...	...	one-fifth.
Lucerne	...	...	...	two-fifths.
Wheat	...	...	...	one-fifth.

It is believed that with this rotation the smaller area under wheat will produce a larger crop. More fodder will also be produced, and with more fodder more cattle can be kept. This again means more manure and better crops all round. The effect is, therefore, cumulative and touches everything in turn. The moral is that, for real improvement, the farm must be considered as a whole. This is, perhaps, a commonplace, but it is apt to be forgotten when, as in this country, agricultural progress has to be approached through a number of different departments each wedded to its own particular activity. We shall, therefore, be none the worse for reminding ourselves occasionally that a farm is a living organism, distinct no doubt in its parts, but bound together by a common life and existing for a single purpose, the welfare of the farmer.

The Training of the Peasant.

That this organism may thrive, it is necessary that the farmer should be trained. This necessity has become more obvious of late, for since the war the peasant has been getting more and more control over the land. The labourer now becomes a tenant at will, the tenant at will a leaseholder or a *metayer* tenant, and all aspire "with incredible fervour" to become proprietors. At each stage in the upward process more knowledge is required, and Serpieri, the leading rural economist in Italy, considers that the ultimate social effect of the process, whether for good or ill, will largely depend upon whether this knowledge is gained.† It is to assist the peasant to gain this knowledge that educational courses have been instituted. These are now one of the chief activities of a Chair and include short courses for the farmer and longer ones for his boys. Both are entirely vocational and are based on the principle that, as the peasant will not go to the school, the school must go to the peasant. In both cases, therefore, an itinerating master is employed, and the closest possible contact is maintained with the farm.

Let us take the adult courses first. At Siena, twelve are held every year by the director and his assistants, and as there are 36 communes in the district and a regular *rotation is followed*, each commune gets a course once every three years. Attendance averages about 40 and includes men of all ages with a predominance of those between 20 and 30. A dozen lectures are given of 30 to 35 minutes each—it found difficult to hold the attention for longer—and each lecture is followed by an hour's discussion. A number of different subjects are dealt with in a single course, but at Rome, with one would think greater wisdom, one course, one subject is the rule, as it is believed that the peasant mind can grasp only one thing at a time. Thus, a whole course is devoted to potato-growing, another to grafting and a third to machinery and implements. The theory of structure of the subject is taught in the school-room, and its practice, so far as possible, in the field. Both magic lantern and cinema are freely used. The latter is found most effective (in France as well as in Italy) and a portable machine can now be had for £30. No charge is made for

* Vigorelli, Un Saggio di *Inchiesta* Sulla Piccola Proprieta in Italia, 1921, p. 10.

† For Professor Serpieri's views on Agricultural Education, see his book, *La Politica Agraria in Italia*, 1925, pp. 145-161.

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the teaching and all travelling expenses are paid. Those who show most intelligence and capacity are taken on a tour of inspection round the district, while others are given prizes of implements or books. Both at Rome and at Siena the results are said to be excellent, for those who are taught not only benefit themselves, but spread the teaching to others. At Rome I was informed that there was not much to choose between the literate and the illiterate—an interesting point, as a report of the Italian Budget Committee of 1924* states that vocational training is of little use if the mind has not been prepared for it by some measure of general instruction.

The Training of the Peasant's Boy.

The courses for boys follow somewhat different lines. They were only started in 1924 and are the result of an official Commission which inquired in 1917-21 into the condition of the peasant proprietor in different parts of Italy. The Commission's report states that there are two ways of giving the young an agricultural education. One is to graft it on to the primary school and give it through the primary school teacher and the other to give it through a special staff to boys who have passed through the primary school. The former is much less costly, but the Commission is against it, as most of the teachers are of urban origin and incapable of teaching agriculture, and their liability to constant transfer makes continuity of teaching difficult.† They, therefore, recommend the latter, and it is the course advocated both by Serpieri and by Laribé, the leading rural economist in France.‡

Both these authorities are agreed that the primary school is not the place for vocational training, and that all that can be done there is to give the school a rural tone and keep the youthful peasant mind fixed upon the land and turned away from the town. This is in itself a sufficiently difficult task, and the complaint is made by the Commission that the present educational course kills the peasant in the pupil.§ The urban school, says Serpieri, has been fostered at the expense of the rural. The former is fairly efficient, but the latter has been neglected and leaves everything to be desired.¶ The differences between the rural and the urban mind, which still exist "in the strongest measure",‖ are a further complication, and even the secondary agricultural schools do little more than train a very limited number of boys for technical posts and the charge of the larger farms. In all of which we are vividly reminded of conditions in this country.

The object of the courses started in 1924 is to catch the intelligent boy when he leaves the primary school and teach him the elements of agricultural science while his mind is still plastic and before he has had time to forget how to read and write. A secondary object is to correct the urban bias of an education based primarily upon the pen. The courses are confined to boys of 14 to 17, who have passed through the top form of a primary school and have, therefore, really absorbed the primary course. Subject to this, anyone is admitted who is connected with the land, but the son of a proprietor is preferred to the son of a tenant and the son of a tenant to the son of a labourer, as in each case the need for training is greater. About twenty boys are taught at a time and 80 lectures (lezioni) are given, spread over a period of three or four months. Each master holds three

* Dated 20th December, 1924.

† *Per la Piccola Proprieta Rurale e Montana*, 1922, ii. 208-9.

‡ Laribé, *Le Paysan Francais après la Guerre*, 1923, p. 26.

§ *Op.-cit.* ii. 194.

¶ *Ibid.* ii. 237.

‖ Serpieri, Op. cit. p. 61.

courses a year in different communes and, that the effect may be last[illegible] repeats them three years running in each commune. He uses the [illegible] primary school, which the educational authorities are obliged by la[illegible] place at his disposal. That his appeal may be as much to the eye as the ea[illegible] he is given a magic lantern (weight about 16 pounds and cost £6 10s. 9d.) and a large assortment of pictures illustrating the animal and vegetable life of the neighbourhood and the different methods of cultivation with their appropriate implements. It costs about £60 to fit out an itinerating school, and, as the master is paid only £90 a year (including his travelling expenses), the cost is not prohibitive.

The crux of the scheme, indeed, is not the cost but the master. The ordinary schoolmaster, says Serpieri is not suitable, for, even if he has the technical knowledge, he rarely has the right spirit. In his hands, instruction "inevitably becomes general and abstract . . . and may even end in his becoming an object of derision to pupils who live amongst practical farmers."* A man who understands both boys and land is required, and he must be a countryman and not a townsman, in order that he may be understood by the peasant. The peasant's vocabulary is not more than three or four hundred words, and a man has almost to be a peasant himself to be able to teach within so narrow a range: yet, beyond this range, as an Italian remarked to the writer, the peasant is lost. It was, therefore no easy matter to find the 100 masters required to launch the experiment. They have been recruited mostly from farm managers, trained agriculturists and primary school teachers with what success it is difficult to say, but one may guess that a hundred men of the right stamp are not likely to have been found at a single blast of Mussolini's trumpet.

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[illegible]hool and spend three or four years there before joining the adult school. The advantage of this is that when he joins the latter his mind is mature. But what if, in the interval, he forgets how to read and write? Here we have a difference between northern and southern Europe, and it is a difference with a lesson for India. Broadly speaking, in the north, once literate always literate, but this is not the case in the south any more than it is in India, for in both a large proportion of those who learn to read and write forget it all in a few years. In Europe this is to some extent a matter of religion. In the Protestant north the mind of the peasant has come under the grand educating influence of the Bible. For generations he has been accustomed to hear it read, and now when he learns to read, he reads it to himself and is able to carry on the education begun at school. But to the Roman Catholic the Bible is a sealed book and reading too often ceases when the school is left.* So is it, too, in India. On leaving school, the boy finds little or nothing to read and quickly forgets what he has learnt. If, therefore, as some think, vocational training requires a literary foundation, it must in this country follow closely upon the primary school or the benefit of the latter will be lost. A possible alternative is to improve the primary school so that its effect endures.

The Punjab.

In the Punjab, agriculture is taught as an optional subject in about 100 vernacular middle schools† which have a garden or small farm (generally the former) attached to them for the purpose, and in 1925-26 over 6,000 boys took it as as subject. But so far, no attempt has been made to give any vocational training either to the grown-up peasant or to the boy whose education stops at the primary school. The immediate problem is to combat the almost universal illiteracy of the countryside; hence the 3,200 adults' schools with their 100,000 pupils all learning the three R's. And there is another problem even more urgent, namely, how to make rural education really rural. In the last Education Report (1925-26) we are warned that the application of an urban system to the village may impoverish the village instead of enriching it, and we are told, what some of us have long suspected, that the "university and secondary school systems tend to suck from the countryside its best initiative and talent." There is some truth in the remark made to me by an Italian economist that education distracts the peasant from his calling. At all costs, this must be prevented in India where 224 millions are dependent upon agriculture. In the past, too much honour has been laid upon "the person of the scribe" and too little upon the person of the peasant. For this the urban master with his urban tastes and ties is partially responsible. It is, therefore, a step in the right direction that an attempt is now being made to bring the primary school "into the closest relation to the life and experience of the people." Fifteen hundred village libraries have been started and are being stocked with books likely to interest the peasant and broaden his mind. More important, a carefully chosen staff is being trained in two schools (Gurgaon and Gakhar) where the atmosphere is entirely rural and attention is concentrated, on one hand, upon community work or service, and on the other, upon village occupations and crafts. It is hoped that, when these men go out into the village, they will infuse a new spirit into the village school, the spirit of service rather than gain, of keenness for land and craft rather than for desk and pen, and of content with the country rather than of yearning for the town. If they succeed, the school will become the centre of village life instead of being its possible canker, and the most difficult problem of all will be solved.

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* Inchieste Parlementare, 1911, ii (2) p. 18.

† In 1925-26 the number was 80, but this year (1927) it is expected to reach 120.

Outside the school, the method of approaching the peasant is much the same in the Punjab as in Italy, though the agency employed is different. There are "hundreds" of demonstration plots which "could be extended to thousands" if the necessary staff were available.* Exhibitions are held at all the more important cattle fairs, and the latter are now being attended by manufacturers of machinery and implements for the display of their wares. A popular novelty is the institution of ploughing competitions which draw competitors from all parts and excite the liveliest interest. At one almost Olympian gathering, which was open to the whole of the southern Punjab, 130 appeared to compete for the medals, cups, cash prizes and ploughs offered by district boards and public-spirited gentlemen. Other ventures are the touring cinema car and the demonstration caravan which itinerates from village to village with bullocks and improved implements and shows how wheat and cotton should be sown. Then there are 100 co-operative Better Farming Societies, still however in their initial stage, the members of which pledge themselves to follow improved methods. But the most original experiment of all is the selection of 56 villages scattered over the province for intensive development. The object is to modernize them completely and show on a considerable scale what can be done by a rational system of agriculture. The detailed reports about them are of exceptional interest, as they show in concrete form what is actually taking root in the village. They speak again and again of improved implements, of Raja and Meston ploughs, chaff-cutters, drills, harrows and hoes, and also of new varieties of wheat, cotton and cane. There is an occasional reference to tube wells, demonstration plots and consolidated holdings, but only one to fruit and manure and none at all to vegetable and cattle. Yet, without an abundant supply of manure, agricultural development cannot go very far, and without fruit-growing, market-gardening or cattle breeding, it is doubtful whether the small holder, who is the typical cultivator of the Punjab, will be able permanently to raise his standard of living. The reports suggest that, so far, progress has been mainly confined to implements and seed and to the study of two or three staple crops, and that the more difficult questions connected with the supply of manure and the best system of rotation and farming are still untouched. They suggest, too, with their re-iteration of a few forms of improvement, that the problems of different tracts have not been sufficiently studied. In reading them, no one would guess that, like Italy, the Punjab has a "wide range of climates, crops and systems of farming."† The explanation is that there have not been enough experimental farms. With its population of 15 millions supported by agriculture, the Punjab, till recently, had only three farms as against eight in Italy with a corresponding population of 19 millions,‡ and only one of the three was to any extent a *barani* farm§, though more than half the cultivated area of the Province is *barani* land.¶ With only three farms, it has been impossible to study different types of cultivation. Attention has been too much concentrated upon cotton and wheat, and too little upon what will benefit the cultivator who has to support a family upon only a few acres. We saw that in the single district of Rome there were as many as twenty demonstration plots devoted to the cultivation of fruit. There is nothing corresponding to this in the Punjab, for, unlike Italy, no systematic experiments have been made in fruit-culture except

* *Report of the Department of Agriculture*, 1925-26. p. 37.

† *Ibid.* p. 10.

‡ Colletti's estimate, based on the figures of the 1911 Census, is 18 millions (*La Populazione Rurale in Italia* 1925, p. 36); one million has been added on account of territorial additions made in 1919.

§ Land dependent upon rainfall.

¶ In the farm at Gurdaspur 100 out of 160 acres are devoted to *barani* cultivation.

dates, though parts of the Province are well suited to the growing of fruit.*

An experimental farm is the necessary background of all demonstration work. It is, therefore, satisfactory to know that two more are on the point of beginning operations and that in a year's time they will be followed by a third. Specialists in fruit and fodder have also been engaged, and the work of the Veterinary Department is being greatly extended, so much so that last year (1925-26) over 600 stud bulls were supplied to the Province. Government is now thoroughly alive to the importance of development and, as the cultivator on his side is eager to learn, great things are possible, but it must be some years before the results of the research now being initiated are available. Meanwhile, there is such a demand for advice and assistance and the officials concerned are so overburdened with work, that it is worth considering whether the present system of employing a number of different agencies (mostly Government departments) for demonstration and propaganda is the best, or whether, as in Italy, the employment of a single agency, charged with co-ordinating all the teaching to be given and in close contact with the individual cultivator, might not yield better results. The single-agency system would certainly be less bewildering to the simple-minded peasant, who must sometimes be puzzled by the number of his teachers. But whichever method is adopted, from our present point of view it is an advantage to the Punjab that the cultivator for the most part lives in villages and not in scattered farms as he generally does in northern and central Italy. The latter system by itself, no doubt, makes for better farming, but the former greatly facilitates demonstration, teaching and training, for in a village it is a comparatively simple matter to get people together. This is an advantage of which the fullest possible use should be made.

The Work of the Cattedre Ambulanti.

A final word is necessary as to the work of the Chairs. The Director General of the organization, whom I had the privilege of meeting, claims for them that they have had a marked influence in four directions: fertilizers have been popularized, fodder crops encouraged, modern ploughs and other improved implements introduced and cattle breeding developed. Their influence has been most evident in the case of the first two. To take a single example, in twenty years, the amount of artificial fertilizers used in Italy has risen from 100,000 to 1,400,000 tons. The war imposed a severe strain upon the staff, as it was everywhere depleted for military purposes, and the political and financial confusion that followed the war only made matters worse. The organization might have collapsed but for the financial assistance of the State. This, however, has led to another evil—excessive State control. "Every day," says Serpieri, "the Chairs tend to become more and more bureaucratic and lose the dynamic force which inspired them at first." They have not succeeded so well in the south as in the north. In some districts of the north—Siena is an example—they have worked miracles, but there are few, if any, cases of this in the south. This is partly because nothing in Italy fares quite so well in the south as in the north, and partly because the Chairs in the south have not been so well staffed, the best instructors preferring to serve in the north. Nor is it yet sufficiently known what is the best system of farming for the hotter parts of the country. Perhaps, the chief advantage of a Cattedra Ambulante is that it provides in every district an organization, which automatically considers the farmer and his farm as a whole and not as a mosaic of different

* Grants of Colony land have, however, been made in three cases on condition that fruit would be grown, and a certain amount of spade work has also been done at Lyallpur in connection with mangoes and figs.

problems to be dealt with by separate departments independently of each other. A further advantage is that being a local organisation it studies local conditions and draws attention to local needs. A good Chair will take on the colour of its environment and interest itself in the questions suggested by its surroundings. As such, it is a useful antidote both to the departmentalism of the experts and to the over-centralization of the State; and being in close touch with the cultivator it realizes what some are apt to forget that the land exists for the peasant and not the peasant for the land.

APPENDIX V.

Can the Small Holder live as he should on his Holding?

This question is perhaps the most important and difficult that we have to deal with in the Punjab. It is important because such figures as are available suggest that three quarters of our cultivators cultivate ten acres or less. It is difficult because by the words "live as he should" I mean live with his family in such a way that they are properly fed, clothed and housed and sufficiently occupied. As the problem has arisen in Europe, I propose in this article to consider how it has been dealt with in three countries, Italy, France, and Belgium. I take Italy first, as it is the country in which it is most acute, and it is also the country which most closely resembles the Punjab.

Extensive Cultivation and Poverty.

In the eighties Count Jacini, whose report on rural conditions in Italy is still worth reading, wrote that "in the greater part of Italy, especially where extensive and promiscuous cultivation prevails, agriculture is exclusively given up to the cultivation of cereals, regardless of the fact that this is being done with implements as old as Adam, that it is exhausting the productive energy of the soil with an incessant alternation of wheat and maize, that no account is taken either of dung or of artificial manures, and that the ploughshare is forced to drive its furrow through thin impoverished soils which could as well be used for profitable shrubs and trees."* Italy, like the Punjab, was then essentially a poor country. To-day this poverty is confined to those parts of the country where agriculture has not progressed. There are, adds Jacini, two types of agriculture, one primitive, simple, patriarchal, extensive, self-contained, entirely dependent upon its own forces, taking from the earth and restoring nothing, leaving everything to the spontaneous action of nature, and requiring two factors only, human labour and a productive soil: the other, intensive, worked like an industry with all the resources of chemistry, mechanics and natural science and requiring two more factors, intelligence and capital.† In its extreme form, the first is hardly distinguishable from the nomad system and is still found in the high mountain areas of Sicily, where the soil is prepared with axe, plough and fire, and after each crop left fallow for four years or more.‡

Between this extreme and the other, there is every gradation of farming, and if the Italian peasant is not so poor to-day as he was forty years ago, it is largely because cultivation has been steadily progressing from the former to the latter. Where it is still extensive poverty remains. In Sicily, the people are better off along the coast, where the vine, the orange and the lemon are grown, than in the interior, where the ordinary rotation is a year of wheat followed by a year of pasture and a year of fallow. With this

* Conte Stefano Jacini—Relazione Finale Sin Risultati dell Inchiesta Agraria, XV 43 (1884).

† Jacini pp. 50-1.

‡ Inchiesta Parlementare Sulle Condizioni dei Contadini helle Province Meridionali e hella Sicilia, vi (i) 117 (1910).

rotation, the basis of production is not repeated manuring but repeated ploughing. The land is first ploughed in January (unless it is being grazed) and again in March, May and July; and it is weeded in September and sown in October. This is curiously like the Punjab, and, as in the Punjab, the ploughing is done with oxen.* In Sardinia, which is "far the poorest part of Italy," all that the peasant proprietor can do, when his land is devoted to cereals, is to repay the grain borrowed for seed and food.† One reason for this and it is a reason that applies to the Punjab—is that the land is fragmented almost beyond belief. Holdings are split into 200, 300 and even 400 microscopical plots some of which may be a mile or two apart, and, in parts of the island, the cactus hedges that divide one plot from another take up nearly half the cultivated area.‡ What is true of Sicily and Sardinia is also true, though in a lesser degree, of much of Southern Italy. Jacini emphasizes "the wretched conditions in many parts of Italy of property which has been excessively subdivided, resulting in a regular proletariat of proprietors, badly housed and badly nourished."§ The small holder is unable to support himself properly by his land unless he can find some supplementary source of income. He would die of hunger, says Jacini, if for part of the year he did not find work elsewhere either in a town or as a labourer on one of the large estates of the plains.¶ Writing more recently, Serpieri states that this is still more or less the case wherever peasant holdings prevail. In South Italy, he says, the commonest type is a poor peasant, generally wretched, who has a bit of land and a hovel and usually some cattle, and who depends for his subsistence on paid labour or on cultivation done for, it may be, several masters in return for a specified share of the produce.‖ And even when he has enough land, he does not know how to cultivate it intelligently. In Calabria, says a report of 1909, "we have not seen one example of a rational manuring. Fertilizers are very little used and implements are almost always the primitive plough and the spade. The modern plough, the reaper and the thresher are to be found on the large estates but rarely on the small."**

The Director General of the Cattedre Ambulanti informed me that, where the peasant depended solely upon cereals, he was not so well off as where he combined them with some form of intensive cultivation. It is one cause of the poverty of the south, that the lack of water—as in the Punjab drought is the enemy—does not usually permit of any form of intensive cultivation away from a town. But where it has been possible to substitute the cultivation of fruit, vegetables and tobacco, for cereals and pastures, the standard of living has generally risen. This has not been possible to any great extent in the mountains which embrace 37 per cent. of the area of the country. Cultivation is mainly confined to grain and potatoes, and, as holdings are small and often fragmented, the standard of living is low and the chestnut is still an important article of diet. In the hills, which cover 41 per cent. of the country, a greater variety of cultivation is possible and the standard of living is correspondingly higher. It is highest of all in the irrigated plains of the north, where farming is most progressive and the cultivation of wheat is based upon an elaborate rotation of leguminous crops combine with vegetables, dairying and silkworms. Here intelligence, enterprise and capital have been available and, climatic conditions being favourable, great things have been done. In lower Lombardy, the very soil has been

* *Ibid*, pp. 117-18.

† Per la Piccola Proprieta Rurale e Montana, i. 132 (1921).

‡ Problemi Italiani, issues dated 15-2-23 (p. 276) and 1-2-23 (p. 229).

§ Jacini, p. 68.

¶ Jacini, p. 27.

‖ A Serpieri, La Politica Agraria in Italia, 1925, pp. 23-4.

ientare etc. V (2) 177 (1909).

artificially formed by filling up swamps, and 2¼ million acres have been reclaimed at a cost of £40 per acre.'

The Predominance of Cereals and its Effect upon the Small Holder.

As in the Punjab, cereals predominate in the cultivation of the country, and of cereals much the most important is wheat. In the five years ending 1923, out of a total cultivated area of 32 million acres† 17½ millions were under cereals and nearly 11½ millions under wheat.‡ Over half the cultivated area is, therefore, given up to grain, but whereas in the poverty-stricken mountains the percentage is 66, in the prosperous north it is only 27. Moreover, in the north, wheat may yield 30 bushels an acre and in the mountains it often yields no more than seven or eight.§ One writer says that conditions in the latter are frequently so unfavourable that it yields no commercial profit; yet it goes on being cultivated and to such effect that 2½ million acres are under wheat in the Apennines and in the mountains of Sicily and Sardinia.¶ This is because the peasant's first care in Italy, as in the Punjab, is to grow what he and his family can eat, and as wheat and maize form the basis of his diet, he grows these before growing anything else. When it is realised that 80 or 90 per cent. of the holdings in Italy are 10 acres or less,‖ the predominance of cereals is explained. In the Punjab conditions are much the same, and in both countries the cultivation of cereals on primitive lines on innumerable small holdings leads to identical results, unprogressive farming and a low standard of living.

One writer in speaking of these holdings in Italy, says that even if they do not fail, they remain "neglected and often almost abandoned" and are of no more use to the community than to the owner who has to work elsewhere. They are too small to give a peasant's family either enough food or enough work. Still less do they allow anything to be saved for an emergency or for development. "Without vigour, without credit, lacking economic value and, if one may say so, moral value also, they actually make a state of bankruptcy seem the most natural condition of the peasant proprietor." The problem, he adds, might be left to solve itself were there not so many small proprietors, were they not always increasing by subdividing their lands, was not a life of hardship and humiliation preferred to sale, and were not small parcels of land so constantly sold to those who had no other land at all.**

Types of Intensive Farming.

Broadly, if the small holder is to be maintained on his land with enough to eat and enough to do, farming must be made more intensive in one of three ways. Either cereals must be eliminated altogether and the holding converted into a market garden, or they must be subordinated to the cultivation of fruit like the orange and the lemon and of special crops like tobacco; or finally, they must be combined with leguminous crops and the breeding and fattening of stock. The first two methods are really subdivisions of the type of cultivation called by the French "petite culture," being based mainly or entirely upon horticulture. The third, which forms a different type and

* Ghino Valenti, L'Italia Agricola dal 1861 al 1911, p. 102 (1911).
† Excluding natural pastures (International Year Book of Agricultural Statistics 1924, p. 50.
‡ International crop Report, 1925.
§ Valenti, pp. 58 and 62.
¶ Valenti, p. 62.
‖ See figures collected by the Italian Ministri of Finance in 1896-7. Conditions are said not to have changed much since. (A. Mortara, Doveri della Proprieta Fondiaria, 1912, p. 93).
** Montara, pp. 99, 100, 309.

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which we may call mixed farming, is based mainly upon the production of meat and wheat. Both types are intensive in character, but whereas the first depends more upon the intensive application of labour than of capital, the last depends more upon the intensive application of capital than of labour. Till recently, the tendency in Italy has been more in favour of the first than of the last. This, no doubt, is largely because Italy has exceptional facilities for growing fruit and vegetables. But it is also due to the rapid growth of population which has led to an excessive subdivision of holdings. The smaller a holding becomes, the more the cultivator is forced to depend upon his chief asset—his labour. He turns, therefore, more readily to the cultivation of fruit and vegetables than to the more intensive forms of arable farming which demand a good deal of capital. Moreover, market gardening will support a larger population than any other form of cultivation. In the country round Naples there are 1,288 to the square mile, which is, I think, denser than anything to be found in the Punjab.* Presently we shall see how this population lives.

Market Gardening.

Vegetables in Italy are grown in two ways, in rotation with cereals, e.g. asparagus, artichokes, cabbages, cauliflowers, tomatoes, onions, celery, watermelons and cucumbers, or in regular vegetable gardens.† There are about 375,000 acres under the former, and perhaps 150,000 under the latter. In both there has been an immense development in the last thirty or forty years. The export of fresh vegetables rose from 13,750 tons in the eighties to nearly 250,000 tons in 1912-13, and the export of pickled vegetables from 600 to over 70,000 tons. Most of the latter were tomatoes, and it is characteristic of the development that has occurred in this class of farming that by 1912 sixty-one tomato factories had been established with an annual output of 10,000 tons.‡ This development could not have taken place without a great improvement in communications and a rapid growth of urban markets. Round every town there is a girdle of market-gardens, and the larger towns with the help of the rail often draw part of their supplies from a distance. Thus, the vegetables of Lombardy, Tuscany and Naples all find their way to Rome and early potatoes cross the Alps into Switzerland and Germany.¶ But, apart from a few areas in Liguria, Venetia and Campania, where market-gardening has become almost an industry, it is rare to find vegetables grown on any scale away from a town. Even round Rome the vegetable radius is not more than ten or twelve miles, and so marked is the contrast between the neighbourhood of a town and the open country that to the traveller the sudden appearance of the market-garden is as sure a sign of the approach of a town as it is in the Punjab. But there is this difference between the two countries: the Italian peasant will generally grow a modicum of vegetables for himself and his family, and even a townlet is sufficient to make him grow them for others. In the wild uplands of Basilicata and Campania, though the townlets (there are no towns) are often perched so high that it takes hours of climbing to reach them, the garden with its fruit and vegetables play an important part in the system of cultivation.‖ In Umbria, where the standard of living is higher, vegetables are actually grown away from the town for sale in the villages,** but this would not appear to be common elsewhere.

* Inchiesta Parlementare, iv (i) 272 (1909).
† L'Italia Agricola e it sno Avvenire. 1920, ii pp. 181, 182.
‡ Kid., pp. 183, 190.
¶ *Ibid*, p. 186.
‖ Inchiesta Parlementare, iv (i) 76 (1909).
** Information given me by a Member of a staff of the International Institute of Agriculture which lives in America.

The Bay of Naples and Fragmentation.

The paradise of the market-gardener in Italy is the strip of country which stretches inland from the Bay of Naples to Caserta. This is perhaps the most intensively cultivated area in Europe, a fact which is due to the fertility of the soil, famous even 2,000 years ago, and the intensity of the labour brought to bear upon it. The density of the population per square mile varies from 500 to 1,100* and, as we have seen, in one area touches nearly 1,300. The land is so fertile that from 1¼ to 2½ acres suffice to maintain a market-gardener and his family.† In 1909, in the seven communes round Naples, out of 13,275 proprietors 69 per cent. had less than 2½ acres,‡ and in the rich volcanic island of Ischia, which guards the mouth of the Bay, 10,300 acres are divided into 6,356 holdings giving an average of little more than 1½ acres each.§ Not all these holdings are market-gardens, and many are so small that to maintain himself and his family the cultivator has to work for others. Comparatively few in this area were said to be well off before the war. The tract is, in fact, a good example of what invariably happens in such circumstances in India, the blessings of nature have been almost entirely neutralised by an increase of population. And, as in the Punjab, great fertility is accompanied by excessive fragmentation.

Great fertility is generally accompanied by a wider variation of soils than where there is a dead level of comparative sterility; and where, as in Italy and the Punjab, the laws of inheritance prescribe the equal division of property, variety of soils leads inevitably to fragmentation, as each heir wishes to get a share of the better lands, which means that he must also have a share of the worse. This is the case with the tract of which we are speaking, and, it may be noted in passing, it is also the case with the rich garden lands round Jullundur which are as much fragmented as any land in the Punjab. Round Naples, each heir tries to get his share of every bush and field, and the smaller the holding the more he tries, so that every kind of land, whether arable, vineyard, garden or pasture has to be split up into as many plots as there are heirs.

This excessive fragmentation seems to accompany the forms of intensive cultivation which are based more upon labour than upon capital, and it suggests that it would be wise in India to consolidate holdings before developing them intensively, by "petite culture," for if the latter is done first, it will make the former more difficult. In Campania, the combination of fragmentation and small holdings has kept the standard of living down and has led to a great deal of emigration. The peasant proprietor is better off than the tenant, but those who can support themselves on their own land are a minority. The majority have either to take other land on lease or to work as labourers, in which case they can only cultivate their own plots on Sundays and holidays. Or one member of the family emigrates and helps to support his family by his savings abroad.†

The Market Gardener's Standard of Living.

The pitch to which intensive cultivation is carried in Campania is a remarkable tribute to the energy of man; but it is a question whether any comfortable standard of living, as the term is now understood, can be maintained by market-gardening. All over the world the life of the

Inchiesta Parlementare iv (i) 68.
† *Ibid*, p. 191.
‡ *Ibid*. p. 68.
§ *Ibid*. p. 164.
¶ *Ibid*, pp. 163, 225.
|| *Ibid*. pp. 163, 225.

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market-gardener is a hard one, and it affects the whole family. In Campania, the wife of the small holder, whether he is a proprietor, tenant or labourer, has to work without ceasing. When obviously pregnant, she can be seen washing the family linen at the public fountain and even carrying it home in a bundle. She has to work almost to the hour of her delivery, and fifteen days later she starts again. Often beautiful at 15 or 20, she is said to be faded by 30, old by 40 and decrepit by 55. The house cannot be kept clean, for the family baking and cooking have to be done in addition to work in the fields, children have to be tended and not infrequently nursed. When the latter is necessary, the infant is taken to the fields and deposited in the shade of a tree while the work is being done, and as it is the custom to nurse a child for eighteen months or two years, the strain is great. As soon as a child can walk, it is handed over to an old woman who looks after it with ten or twelve others for a halfpenny a day. Only those who own a good deal of land escape the unending burden of toil, and the wife of the tenant fares worse than the wife of the proprietor, as a high rent has to be paid and it is paid partly out of her labour.*

Mixed Farming.

Since the war, everyone wishes to be more comfortable and do less work. The wife of the market-gardener, therefore, it no longer held up as a desirable state. At the same time, there is everywhere a movement in favour of the small proprietor as against the large proprietor on the one hand and the labourer and tenant on the other. This means the multiplication of small holdings and raises in a crucial form the question how a higher and more comfortable standard of living is to be obtained on a small holding. The remedy advocated is the mixed farm intensively cultivated; and, as this requires capital and a compact holding, two more remedies are prescribed—co-operative banking (to eliminate the usurer) and consolidation. The mixed farm depends primarily upon an elaborate and scientific system of rotation. It may perhaps be doubted whether this is feasible upon a holding of a few acres, but it is clearly impossible when the few acres are split up into plots scattered round the village. All writers, therefore, insist upon the paramount necessity of consolidation as the indispensable condition of any real development. The provision of capital is also important. Serpieri reckons that to convert extensive cereal cultivation into intensive requires 400 lira per acre for the simplest start and from 1,600 to 2,000 to do it well.† Cattle have to be partially stall-fed instead of being allowed to pasture wild; well-drained byres have to be built, manure has to be stored and supplemented by artificial fertilisers; water has to be economised by a system of carefully constructed channels, and fruit trees have to be planted.

The Problem of Work.

The problem, as already stated, is not only to give the small holder enough food but also enough work. When cultivation is extensive, periods of idleness alternate with periods of overwork. In the former, every kind of mischief is hatched, and, in the latter, either the family is overworked or the work is badly done. In the Punjab, it is doubtful whether the small holder ever works for more than 200 days in the year unless he is cultivating his land more or less intensively. In Japan, even with intensive farming, the position would appear to be much the same,‡ and in the

* *Ibid*, pp. 262-64.
† Per La Piccola (Op cit), ii, 255 (1922).
‡ See Robertson Scott, The Foundations of Japan, 1922, pp. 64, 237.

interior of Sicily, where there is no intensive farming, he is said to work for only 150 to 200 days in the year.* In South Italy, the period depends upon the nature of the farming. In the Abruzzi mountains, where there is a long winter and farming is simple, it varies from 180 to 200 days,† but wherever fruit is combined with grain, it varies from 200 to 250 days,‡ and where *petite culture* prevails, as in the country round Naples and along the coast of Sicily, the average is from 250 to 260.§ From this point of view, therefore, the market-gardener and the fruit grower have an advantage over the arable farmer; but monoculture, as this form of farming is apt to be, is a risky business, and if anything goes wrong with seasons or markets, the cultivator may find himself on the rocks; whereas in a country like Italy, which has a considerable urban population and imports a large amount of grain, a market can always be found for meat and wheat.¶ For the small holder, therefore, the mixed farm has two advantages over the market-gardener—it provides a more comfortable life and is less risky business. And in a country in which the cultivation of cereals is necessary, it is also a protection, for cereals suit the large farm better than the small, and if the small holder grows nothing but grain, he runs the risk of being driven out by the large.‖ In the Abruzzi mountains, where the cultivator is employed for only 180 to 200 days in the year, the customary rotation of wheat, maize and potatoes is being modified by the introduction of leguminous crops such as clover, sainfoin, and lucerne; and at the same time an attempt is being made to substitute stall-feeding and cultivated grasses for the immemorial custom of everyone's cattle being pastured together, a system that is bound up, as in India, with fragmented fields and a primitive rotation.** Broadly, it may be said that at present all over Italy, where cultivation is still in a primitive or semi-primitive stage, the main effort of the Agricultural Department is in this direction, and as was shown in the article on the Cattedre Ambulanti Mussolini's "Battaglia di Grano" is being fought on the same lines.

The Importance of Fodder Crops.

It seems that very few peasant proprietors are able to support themselves from their land by the cultivation of cereals only. Nearly all combine it with some form of intensive cultivation, and in grain areas, the progress of agriculture may almost be measured by the part played by fodder crops in the local rotation. The development of these crops is important not only because it increases the productivity of the land, but also because it encourages cattle breeding. In Umbria, and no doubt elsewhere as well, the *metayer* tenant maintains himself by his land, but such surplus as he earns comes from his stock—from the cow he milks, the calf he fattens and the pigs and poultry he breeds.†† Presently, we shall see that the same is true of many peasants in France. Valenti says that the cultivation of cereals requires the support of cattle breeding,‡‡ and for this the extension of fodder crops is naturally essential. It is one of the causes of the greater poverty of the mountains that fodder crops represent only 10 per cent. of the cultivation, and as the mountains include rather more than one-third of the total area, this affects the whole country.§§ In the south and the

* Inchiesta Parlementare, vi (2) 21.
† *Ibid*, ii (i) 109.
‡ *Ibid*, v (2) 270, Vol. iii (1), 312.
§ *Ibid*, iv (i) 279.
¶ Valenti, p. 108.
‖ Inchiesta Parlementare, iii (i) 737 (1909).
** *Ibid*, ii (i) 27 (1909).
†† Information given me as above (p. 8—footnote).
‡‡ Valenti, p. 107.
§§ L'Italia Agricolo (of. cit.) ii, 9.

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islands, fodder crops play an unimportant part and cereals almost always alternate with pasture, or in Sicily with the bean. The following figures show the effect of this upon the yield of wheat and maize:—*

	Wheat. Bushels per acre.	Maize.
Alps	16	28½
Northern Apennines	15¾	19½
Southern	10¾	13½
Sicily	11	9½
Sardinia	10	—

Serpieri, following Valenti, lays equal stress upon the development of fodder crops and says that, throughout Italy, there is a want of equilibrium between their cultivation and the cultivation of cereals. The aim, he says, should be to create "in mountain, hill and plain" the conditions likely to promote a great development of cattle breeding, and he pertinently observes that the object of this is not to increase one particular means of production, but through an agricultural system *meglio enquilibrata e rinvigorita* to increase production under every head.† How this can be done has already been explained in my article on the Cattedre Ambulanti. The policy has been widely applied in the Alps and with the happiest effect upon production. Serpieri goes so far as to say that it is the real agrarian revolution that has taken place in Northern and Central Italy and in many parts of Europe.‡ But it has hardly begun in the Southern Italy, where the cultivator barely knows of the existence of hay and of the possibility of stall-feeding.

Size of Holdings.

From what has been said, it is perhaps clear that, broadly, there are three types of cultivation practised by the small holder in Italy: firstly, the extensive or primitive system of farming to be found in the southern Appenines, the uplands of Sicity and Sardinia; secondly, the system associated with horticulture in which labour rather than capital is intensively applied; and finally, the system of mixed farming in which the emphasis is more upon capital than upon labour. We must now consider how much land is required to support a family in any comfort in each of these categories.

We have already seen that round Naples, where market-gardening prevails, a family can live, though not very comfortably, upon an acre or two of land, a fact which, curiously enough, agrees closely with the experience of the very similarly-situated tract of the Chhachh in the Punjab. On the Bay of Salerno, where cultivation is almost equally intense but depends more upon fruit than vegetables, four to five acres are required, and where the orange and the lemon are grown, 2½ suffice.§ So, too, all along the sunny slopes of the hills that look out over the Mediterranean, provided that water is available. In Apulia, where the climate is dry, it is calculated that to give a family of five enough food and work when cereals are planted between the vines and there is a small garden as well, 12½ acres are required plus another 25 acres of pasture to support a flock of 25 sheep.¶ In Calabria, where cereals are grown between the fig, the olive, the mulberry and the vine, and the land is not irrigated, 10 to 25 acres are required,‖ and in

* *Ibid*, ii, 10.
† *Ibid*, ii, pp. 49, 51, 53, 61.
‡ *Ibid*, ii, 51.
§ Inchiesta Parlementare, iv (i) 75.
¶ Per La Piccola Proprieta, ii, 193.
‖ *Ibid*, ii, 138, and Inchiesta Parlementare, v (2). 38.

Sicily the corresponding figure is 15 acres.* The report from which these figures are taken, mentions an area in which out of 1,200 families occupying less than 2½ acres only 69 were well off.* In Central Italy, where the vine and the olive are admirably cultivated in combination with cereals on the famous *metayer* system, the estimate of what a family requires varies from 10 or 12 acres in Tuscany to 15 or 20 in Umbria and Siena. The latter estimate applies, too, to the mixed arable farms of Modena.† This is of particular interest to us in the Punjab, as it corresponds closely with the average holding in the Lyallpur Colony (18 acres),‡ where the Punjab cultivator is at his best. The Modena figure is also significant, because in this district everything is in favour of the cultivator; the average yield of wheat is over 20 bushels to the acre; the dairy industry is highly developed and the farmer's business co-operatively organized. Can we wonder that the ordinary cultivator in the Punjab with his few acres is badly off?

Where farming is extensive, and cereals predominate, the figures are naturally much higher. In the dry areas of the south, 50 to 125 acres are required,§ which may be compared with the 70 or 80-acre holdings of Sirsa and Fazilka. It is much the same in the Marches of Central Italy, and in parts of the Maremma, the estimate touches 150 acres.¶ Even in the hilly country of Siena, where agriculture has definitely begun to progress, 35 to 40 acres are said to be necessary.‖

These figures are rather broad indications of tendencies than precise statements of fact. But they have value as they show clearly that the amount of land which a man requires to support himself and his family varies greatly according to the way in which it can be cultivated. For the market-gardener, it may be said that from one to 2½ acres are sufficient, and for industrial crops like tobacco and the more intensive forms of fruit-growing four or five acres are enough. But where cereals play at all an important part, the minimum is 12½ acres, and it is only as low as this where the vine is grown as well. Where the farm is entirely arable and a fairly high standard of living is maintained, it is nearer 20.

France.

Now let us see how these figures compare with France. This we are able to do, as the point came under enquiry in 1908-9 when every district (department) in France submitted a report in the form of a monograph on its agricultural conditions, incidentally indicating the limits of small, medium and large holdings.** At least 48 districts have areas wholly, or almost wholly, given up to cereals. In only four of these is the dividing line between the peasant and the medium proprietor put at less than 25 acres, viz.:— Haute-Savoi (20 acres), Loire Inferieure (12½), Pyrenees Basses (12½), and Haute Saone (15). And it is significant that in the first two, as in Modena, dairying is of importance, while in the third, emigration is a factor, and in the fourth, the small proprietor does no more than live.†† In 29 districts, the line of division is drawn at over 25 acres; in 15 it runs up to 50, and in one (Oise) which recalls the Italian Marches and Maremma, it goes up to 125.‡‡

In 40 districts, there are areas devoted entirely, or almost entirely, to *petite culture*. In 18, the line for this class of cultivation is drawn at less

* *Ibid*, ii, 204.
† Information given me by the Cattedre Ambulante at Siena.
‡ The Punjab Peasant, p. 149.
§ See Inchiesta Parlementare iv (i) 74, v (2) 152.
¶ *Ibid*, iv (i) 73.
‖ See my article on the Cattedre Ambulanti.
** La Petite Propriete Rurale En France—Enquetes Monographiques, 1908-9.
†† *Ibid*, p. 210.
‡‡ *Ibid*, p. 175.

than five acres and in one only at over 12½ acres. Round Paris, as round Naples, less than 2½ acres can support a family. Before the war there were twelves to thirteen hundred market gardeners in this area with holdings of slightly less than two acres each. They managed to support themselves and their families as they got six or seven crops a year out of their land.* By their industry and constant manuring they have raised the value of the land ten-fold. In Vaucluse, which is described as "*le departement priviligié de la petite culture*", the cultivation of asparagus and the strawberry had raised it before the war from 20 to 2,400 francs an acre. This has not been done by labour only, for the cultivator has his glass frames, his forcing houses, his heating apparatus and his pipes.†

Speaking generally, the different reports suggest that for cereals 25 to 50 acres are needed, for "*petite culture*" 2½ to 12½ acres, and for a mixture of both 12½ to 25, according to the proportions of the mixture. The correspondence between these figures and the Italian is remarkable. The following points must, however, be noted.

Firstly, cereals are nearly always combined with stock-breeding or dairying, or with both; and in addition there is the produce of the poultry yard, the garden and the orchard, and it may be a plot of tobacco as well. Pigs, too, are generally kept and sometimes sheep and goats; and occasionally carting is done or cider made. The more these different elements are combined and more the science is applied, the nearer the limit can be to 10 acres. Where the peasant is described as doing well on less than 25 acres he is usually said to use artificial fertilizers, improved implements like harrows and hoes, and even a machine or two, such as a small reaper or thresher. And where the small holder is able to hold his own with large in cereal areas, he owes it to the help derived from his poultry yard, his dairy, his pigs and his stock.

Secondly, as in Italy, market-gardening nearly always seems to be due to the neighbourhood of a town or factory or to some special climatic advantage combined with first-rate transport facilities. The bulk of the market-gardener's produce has naturally to be sold, and as it perishes quickly it has to be sold at once. If, therefore, there is no market in the neighbourhood, it must be possible to reach other markets quickly. First and foremost, there must be roads, and it may be said that without good roads there can be no market-gardening away from a town, and, if distant towns are to be reached, there must also be good railways. In France, cabbages, peas, onions and artichokes are sent in masses from Brittany to England, Switzerland and Belgium; and flowers are grown in the Riviera to adorn the tables of London and Paris, to such effect that before the war an acre of land produced from £100 to £130 a year and yielded a net profit of from £16 to £32.‡

In Italy, the proprietor clings to his holding at all costs, but the 87 monographs of the French enquiry suggest that the French peasant is not prepared to accept the low standard of living involved in a very small holding or to live on it at the price of running into debt. He either limits his family or buys more land, or, if he cannot buy, takes it on lease in the hope of being able to purchase it later. Or, if this again is beyond him, he goes out as a labourer. If the worst comes to the worst, rather than live a miserable life upon the land he sells it and migrates to the town or goes abroad.§ The advantage of this rural exodus is that it enables those who remain to enlarge their holdings, and this is why in France, but not in Italy, such holdings have increased in area rather than number.¶

* *Ibid*, p. 226.
† *Ibid*, p. 262.
‡ See *Ibid*., p. 20, and Laribe; L'Evolution de le France Agricola, 1912, pp. 71-4.
§ *Ibid* (La Petite Propriete), p. 275.
¶ *Ibid*, p. 68.

Oral Evidence.

44,604. *The Chairman*: Mr. Darling, you are Commissioner of Income-tax in the Punjab?—Yes.

44,605. You have provided the Royal Commission with a note of the evidence that you wish to give. Do you desire to make any statement at this stage in addition to that which you have already submitted, or may we ask you a few questions?—There is only one small correction that I wish to make, and that is with regard to the present position of the moneylender in the Punjab. I have stated on page 593 of my note that all reports agree that the agriculturist moneylender is steadily advancing, except in Amritsar district. I have received the Jhelum report since and Jhelum is a further exception: that is the only correction I have to make.

44,606. Your note of evidence combined with your book which we had the advantage of reading gives me at any rate, all the information that I desire, and I have very few points to ask you. Have you studied closely the rural problem of Japan?—Not at all, only through Mr. Robertson Scott's book—"The Foundations of Japan"; I have never been in Japan. I think, however, from what I have read that it would repay study; the conditions seem to be very similar.

44,607. On page 583 of your note of evidence, you suggest that it might be worth considering whether research in this Province should not be concentrated upon the more important crops. Is it your idea there that research should be organized by crops regardless of provincial or other territorial boundaries?—I do not see why the two methods should not be combined. I would not suggest that it should be confined to single crops, but I think it might be worth considering whether it would not be a good thing to take a staple crop like wheat and organize research into it irrespective of territorial boundaries.

44,608. On an All-India basis or on a provincial basis?—I cannot say, I am not an expert. I only throw out the suggestion as I notice they do it in Italy. Personally, I should like to see research more organized from the point of view of the holding that it is desired to improve, and assuming that there are three types of holders, the small, the medium and the large, I think it might perhaps be a good thing if research could bear that more in mind. One form of research may be useful to the big and not very useful to the small man. The latter has not been sufficiently borne in mind. If the small man went to anybody who had been engaged in research and asked him for advice as to how he should live on his five acre holding, he would probably not get a clear answer.

44,609. Are you thinking particularly of the small man in *barani* districts?—Everywhere, but particularly in *barani* districts. It seems to me that almost nothing has been done for the man in *barani* districts, or rather not nearly as much as he deserves.

44,610. We have your views on the problem of indebtedness. I understand that, broadly speaking, your opinion is that the problem should be attacked rather on the lines of educating the debtor than attempting to curb the moneylender by any legislative checks?—Exactly so; that is very important I think.

44,611. Regulating moneylenders does very little good?—It may even do harm.

44,612. Do you think he has had a fair hearing?—Not recently; when I say recently, I mean in the past two or three years.

44,613. Do you regard the rate of interest charged by the moneylender as too high having regard to the risks?—That is a very difficult question to answer, but my impression is no. I am speaking very generally;

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not mean to say that there are not many exceptions; when the ender gets the opportunity, he will squeeze the last farthing out of a man. But, as I say, that is a question on which it would be very difficult to express a definite opinion in a few words; one would have to make so many qualifications, for the position would be different in a district like Attock and in a district like Lyallpur. But taking the Central Punjab as typical of the Punjab, I should say no.

44,614. On page 584 you say "The best indirect means of combating usury is the development of communications, education and joint stock banks." Would you enlarge a little on the possibility of developing joint stock banks?—One reason why there are so many moneylenders in the Punjab is that, if anyone has any money to spare, he finds moneylending the most convenient form of investment. If a man has money to spare in England, he puts it on deposit, whereas the man who has any money to spare here turns to his neighbour and invests it in him. Then again, with the freer circulation of money, I think that the rates of interest would probably fall, and this would be an advantage as more money would be available for productive lands. At present, there is very little differentiation in the local village market between productive loans and non-productive loans. The joint stock bank would, of course, first of all see that the money which it advances would be for productive loans and not for non-productive loans, unless of course very good security were forthcoming. I think you will find that in Europe, particularly in Germany and North Italy, this has been an indirect means of combating the usurer who has been very strong in both countries but is now almost non-existent.

44,615. In this Province, for instance, you lack, I suppose, the urban investor for the capital required for the joint stock bank and the habit of investment in a bank is not developed at all?—It is being developed; the co-operative societies, I think, have done a great deal in that direction, and the Imperial Bank, of course, has greatly increased its branches during the last three or four years, though it is too early yet to judge the effect.

44,616. Are there any indications that Indian traders in the towns, such as prosperous shopkeepers and the like, are on the look out for safe investments?—I think so.

44,617. Again that is a beginning only?—Yes.

44,618. There are, I think, investment societies organized on a co-operative basis in the Province?—No, I do not think so. But the position in the Punjab is very like the position in England during the sixteenth century when the land and usury questions were the two most important questions of the day. In the following century, when commerce began to look up, you find that the question of usury had fallen very much into the background as a result of the advance in commerce and communications. But in the middle of the sixteenth century every one in England did exactly what everyone in the Punjab does to-day, that is, if they had money to spare, they would lend it. This general tendency to do money-lending is one of the difficulties which Government would have to face in dealing with any attempt to control the moneylender by law.

44,619. Would you expect one consequence of a development of the tendency to invest to be a reduction in the value of land?—Yes, I think it probably would, but there might be other counteracting factors. Undoubtedly one reason why so much money is put into the land is that it is the safest and the easiest form of investment.

44,620. You sound a note of warning as to the danger of attempting to proceed too fast in the general agricultural and rural development of the Province. Do you form the view, broadly speaking, that the

present rate of advance in the Punjab is sufficiently rapid?—I should say so, although I am not personally in touch with it: but whether it is on the right lines is another matter. The danger now is that it may become too rapid. Very much depends upon personnel in this country; you must get the right man and train him carefully. I speak from experience gained in my own department.

44,621. There is a risk of declining efficiency in the subordinate grades of the service?—I think so, and it may react against any forward movement if you send out the wrong man to advise the cultivator, for he might give the right advice in the wrong way and thus set the cultivator against any kind of advice whatever. I think myself that it is essential that we should proceed slowly and cautiously in this direction.

44,622. Towards the end of your note, you make a strong plea for the appointment of an Indian representative at the International Institute at Rome. What type of man have you in mind?—The first qualification must be a knowledge of French. That is unfortunate, but necessary, as all the discussions are in French. He should also be an expert in some aspect of rural economics, and the more weight he can carry personally the better. He must be able to give useful advice when he gets inquiries from India, because the staff of the Institute is perhaps not sufficiently well equipped at present to give that advice. If he were not in a position to give the advice himself and were not familiar with the books in which the necessary information could be found, he would not be of as much value as would otherwise be the case.

44,623. It has been suggested that a pensioned officer should be appointed?—I think that would probably be necessary, but in that case I suggest someone should be chosen who has only just left India. It is important that India's representative at the International Institute should have been recently in close touch with India.

44,624. What would it cost Government?—I have not worked that out, but my impression is it would probably cost about Rs. 10,000, if he were treated on the same footing as Sir Thomas Elliott was when he represented the whole Empire.

44,625. And now Mr. R. J. Thompson?—Yes. The scale of salaries at the Institute is exceedingly low, so that, if that scale is followed, it should be possible to do it very cheaply.

44,626. You think that his services would be of great value to Indian agriculture?—I think they would. Personally I found the Institute of value, and it would have been of even greater value to me if I had found someone there who could advise me as to reading. So far as India is concerned, the Institute hardly exists, but through no lack of will on its part.

44,627. Have you ever heard it suggested that there should be an All-World Tropical Institute?—Yes.

44,628. That would probably compete with Rome and to some extent take the tropical work away from Rome. What is your opinion on that?—I have never considered the point, nor do I know what would be the scope of the Tropical Institute, whether it would be for research or for exchange of information.

44,629. It would do for the tropics what the Institute at Rome is now doing for all the world?—I think if you already have an organisation it is better to use that rather than start another.

44,630. It is your experience, I gather, that comparisons betweeen conditions in India and conditions in European countries have yielded very valuable suggestions?—I think so. Whenever I am reading anything on Southern or Central Europe I always feel at home at once,

and I heard the other day that an Italian who was out here felt exactly the same thing when he began inquiring into conditions here. I think there is a very close affinity; but that does not apply so much to Scandinavia and Northern Europe, and still less to England.

44,631. I gather you are not altogether happy about the Land Alienation Act, and that in your view the time has come to review the position in relation to that Act?—That is a very big question, the answer to which depends to some extent on whether the emphasis in regard to the work of this Commission is to be laid on the improvement of agriculture or on the improvement of the agriculturist. If you are going to lay the emphasis on the improvement of agriculture, then I think a strong case could probably be made out for reconsidering the Alienation Act; and I am inclined to think that, even if the emphasis is laid on the improvement of the agriculturist, a case can be made out for reconsidering it. What one feels about the Act is that when it was passed the conditions were totally different in many ways from what they are now. The Act may be in place in a static community but is less so in a dynamic community, and its seems to me that the Punjab is just beginning to emerge from the static into the dynamic.

44,632. Might there be a case for rendering its provisions inoperative in certain districts while leaving them operative in others?—I find it difficult to believe, from what I have seen of the canal colonies, that it is any longer necessary there, but there again one wants to be in full possession of the facts before expressing a definite opinion. I think myself the time has come to reconsider its application to the more advanced parts of the Province. That does not necessarily mean that I should vote for its repeal when all the facts were laid before me.

44,633. You do not wish to suggest any direction in which amendment might meet some, at any rate, of your points of objection, while leaving a measure of protection to those for whose benefit the Act was passed?—The idea of restricting alienation is not peculiar to the Punjab. A form of it existed in Germany in the eighteenth century which, however, was repealed in 1807, when Germany decided to go forward. Since the war various countries, mostly in Eastern Europe, have felt the necessity of protecting the smallholder. There are various Homestead Laws which began in America in the early part of the nineteenth century, came over to Europe in the last half of that century and were adopted in France, Germany and Switzerland and rejected in Italy. Recently, in Roumania and Poland an attempt has been made to prevent a person acquiring more than a certain amount of land. In Roumania, the maximum is 62½ acres in the hill country and 250 acres in the plains. There are various alternatives which could be considered. Therefore, I have not studied the question sufficiently to say whether any of these would be applicable to the Punjab, but the Land Alienation Act in its present form is certainly not the only thing that can be done to protect the peasant and keep him on his holding.

44,634. In this connection, you are anxious, if possible, to make an opening for the successful business or professional man who has acquired sufficient capital to embark on agriculture?—That is a question on which I tried to get information when I was in Europe. My general impression is that in the most progressive countries the urban element has been a very important one in development. That is certainly the case in Germany, and emphatically the case in Northern Italy. The great reclamation schemes which have been so extraordinarily successful in Northern Italy have been very much the result of urban capital and intelligence. The authorities I have been able to consult all seem agreed that you get a more intelligent and progressive spirit with the introduction of the urban element. On the other hand, they all agree there is nothing

whatever to be said for encouraging the urban man to acquire land who continues to live in the town. The two chief authorities of Italy and France are both agreed on that point. The answer to that question for the Punjab, therefore, depends on what you think will be the consequences of opening the land market to the non-agriculturist classes. It is an extremely complicated question. But, the Punjab having reached its present position, it seems to me the time has come to review the whole position in regard to the Alienation Act. No one can doubt who knows the zamindar that he regards it as his Magna Charta, and that point of view is entitled to the very greatest respect.

44,635. Turning for a moment to the existing landlord class, do they show any signs of wishing to take a lead in progressive agriculture?—I made certain inquiries on that point in connection with my book, and the result was most disappointing. There is this to be said for the Punjab landlord, that there are only a few countries in the world where the landlord has shown any sense of social obligation in regard to the development of his land, so that if the landlord in the Punjab has been lacking in that respect, he is no better and no worse than most of his colleagues elsewhere. There are very few signs of a progressive spirit in the Punjab, although there are notable exceptions, of course. Unfortunately, the landlord zone is one of the least developed areas of the Punjab, and so the landlord comes under the influence of an essentially unprogressive atmosphere. I refer to Attock and the valley of the Indus generally, Muzaffargarh, Mianwali and so on, an area that is one of the most unprogressive in the Punjab. With very few exceptions the landlords have done little to mitigate this. It seems to me of great importance that they should be roused to a sense of their obligations, because in reading of agricultural progress in Europe one is very much impressed by the part played by the landlord in Germany, and even more in England and Scotland. The best authorities in Germany say that without the landlord agriculture could not have progressed to anything like the extent it has. Looking to a progressive future for the Punjab, one must emphasise the importance of landlords, and it seems to me the appeal must be to the social rather than the economic obligation. The ordinary landlord has enough to live on, and when a man has that in this country he is generally fairly contented. If you were to say to the ordinary landlord "You will make more money by doing this or that" the appeal will not go far home, but if you could appeal to the obligation on his part to do something for his fellows, I think the appeal might go further and be more successful.

44,636. You do not get men with an agricultural hobby in this country, men who, while not able to spend lavishly, nevertheless are prepared to spend a certain amount of money in an attempt to improve, say, the breed of cattle?—A man like that is very rare in India, I think. The position in the Punjab corresponds exactly to the position in Southern Italy and Sicily. I do not think there is any difference between the two. The correspondence extends so far that, in Muzaffargarh, the landlord, rather than develop his land, will mortgage it to acquire more land. He does exactly the same thing in Sicily.

44,637. Do you think any means are to hand for stimulating ambition on the part of the zamindar?—I think more emphasis might perhaps be laid on the need for such activity in colleges such as the Chiefs' Colleges. That is the time when a boy's mind is malleable, and that would be the time to inspire him with the idea. On the other hand, I remember meeting a prominent landlord in a certain district who had been at a Chiefs' College and who had been inspired with the idea and who went back to his estates anxious to improve them. He did so for two or three years, and found himself becoming increasingly unpopular. He discovered the reason was that

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he was trying to improve his estates. That involved sacking a good many people and generally interfering with people's comfort, and it entailed a great deal of work on his own part, so that he had not much time to visit and gossip with his fellows. He told me that it was not until he gave up all idea of trying to improve his estate that he regained his personal popularity.

44,638. So a man is not respected by his neighbours and friends for any work he may do in that direction?—He was not in the past, but there is a new atmosphere now in this Province and it is not fair to judge the future entirely by the past.

44,639. You have given some interesting notes on the movement in Italy called the Cattedre Ambulanti. Do you think that is applicable to the Punjab?—You mean that particular form of organisation? I am inclined to think it is.

44,640. In what essentials does it differ from the idea of peripatetic demonstrators?—In Italy, all demonstration and propaganda is done by this single organisation, which is, at any rate in theory, independent of Government control; whereas in the Punjab, and I suppose in India generally, each department does its own demonstration and propaganda. I understand, however, that an attempt is now being made in the Punjab to develop Rural Community Councils, with the idea of establishing something which seems to me similar to the Cattedre Ambulanti. I think that is a good idea.

44,641. *Sir Henry Lawrence*: You say this Italian organisation is non-official?—The Cattedre Ambulanti was originally a local organisation formed by various local bodies interested in the development of agriculture. It was entirely unofficial at the start, but now the State has taken possession of it, as it has of so many other things; with what results remains to be seen.

44,642. *Sir Thomas Middleton*: Do these local bodies correspond in some respects with the Indian District Boards and the English County Councils?—Very much, I think; they were the moving spirit. The point is that if you go to the office of one of these Cattedre they will give you an answer on any rural problem you like to name; there is a single organisation. I imagine a humble peasant would find it much more convenient to be able to go to one office and get all the information he wanted than be told he must go and see the Forest Officer about this and the Canal Officer about that and so on. That involves an effort which the ordinary man in this country is either too lazy or too diffident to make.

44,643. Was the parallel organisation in Germany run by the Chambers of Agriculture?—I know very little about it. There are Chambers of Agriculture there, but I have not gone into their work.

44,644. *The Chairman*: Do you think the type of man required to lead these local centres of general propaganda could be found in the Punjab?—I think so; the Cooperative Department has been singularly successful in getting the type of man that would do well; but he would have to be selected with care and also trained; you will not find them for the asking, but I think they could be found. In fact I think that anything almost can be done in the Punjab if it is done sufficiently methodically and slowly.

44,645. No doubt you have studied the problems arising when an agricultural community embarks on the adventure of growing money crops rather than food crops?—Yes.

44,646. Setting aside the canal colonies for a moment, conceive a case where that experiment is being made by the ordinary cultivator who is thinking of taking up cotton or, it may be in other Provinces, ground nuts; do you think there is a danger in the Agriculture Department encouraging that tendency too strongly?—With what class of men? So much depends upon the type of cultivator you are speaking of.

44,647. It is very difficult to define?—I do not think there has been much danger in the past of the tendency being pressed with the small man, because the Agricultural Department as a whole has been much more concerned with the medium or big man; also the instinct of the small man to grow the food which he requires for himself and his family is overpoweringly strong. It is probably as strong in southern Europe, and even in Germany a great deal is still grown for subsistence purposes. There is more to be said for subsistence farming than the theoretical economist perhaps allows because it is safer to grow your own food than to depend upon a distant market from which you may possibly be cut off or which may charge you a price you cannot pay.

44,648. Is there not also a great danger that alteration in price levels may cause distress for a season or so?—With subsistence farming you are not likely to get such wide variations of prices; that is another point in its favour.

44,649. And yet it is difficult to see how the standard of living of many cultivators is to be substantially raised unless they can produce, in terms of money value, on their holdings, more than they are likely to be able to produce with food crops?—The possible remedy is for them to change their diet or widen it, as has been done in the Punjab in the last 25 years. You find the orange penetrating to villages where it was never seen 25 or 30 years ago. Instead of letting it come to them from Lyallpur or Gujranwala or Amritsar it would be much better to grow it in the village itself.

44,650. That is so far as bettering his standard of living is concerned?—It applies equally to vegetables.

44,651. That is confined to his food; it does not supply him with any surplus of purchasing power which he can devote to buying, for instance, manufactured articles?—He must of course grow something that he can sell to buy the things that he cannot grow, but these things fortunately in India are very few; it requires very little to clothe a peasant in this country and he requires very little furniture; his standard of living is quite different from the standard that is necessary in central and northern Europe. That is a strong point in favour of the Indian cultivator; with a reasonable holding he could probably do all that out of a quarter of it.

44,652. Does not an important part of the case for subsistence farming rest on the assumption that the farmer is going to hold the food grains that he grows for his own consumption, whereas, in fact, he very often markets the crop and buys again?—I do not think that is very often done in most of the Punjab; but it is in the more backward parts, in Gurgaon, Muzaffargarh and Dera Ghazi Khan, where the cultivator is apt to be entirely in the hands of his money-lender whom he uses as banker and storekeeper; but I do not think you will find that done in the central Punjab.

44,653. But where it does occur, the case for subsistence farming goes by the board, does it not?—Yes, certainly; but that is a matter of improving the money-lending system. If it is not done in most of the Punjab, one may be confident of being able to stop the rest.

44,654. Wherever the cultivator turns the produce of his land into cash, the market in which he buys becomes just as important to him as the market in which he sells, I suppose?—Yes, certainly.

44,655. The importance of good communications in relation to his selling market is often emphasized but good communications in relation to the market in which he buys the necessities of life, if he buys them, is a very important consideration?—Certainly. Prices in the remoter parts of the Province are noticeably higher. When I was in the Co-operative Department, I had to deal with one of these tracts, and this was one of the difficulties: the cultivator got a much lower price for his produce and had to

pay a much higher price for his commodities; that was one reason why the area was in very low water.

44,656. How often, do you suppose, does the average cultivator in the Punjab go to market to sell his produce?—That I cannot say; I have never enquired.

44,657. It occurs to one that the loss which he may incur on these comparatively rare occasions when he goes to market, owing to his not getting the best prices which he might get, is sometimes rather over emphasized in comparison with the slow but steady drain on his means which occurs owing to his paying slightly more day by day for anything he may buy; in other words, that the buying side of his budget is sometimes neglected?—Yes; no doubt that is an important factor.

44,658. Have you studied the problem of price levels in the rural areas?—No.

44,659. Has that been studied at all in the Punjab?—Two very interesting articles have been written by Professor Myles and Professor Brij Norrain comparatively recently; but they took the Province as a whole as far as I can remember.

44,660. Did that include retail price levels?—Speaking from recollection, I think they were wholesale price levels; I am not certain about that.

Mr. Calvert: It was retail.

44,661. *Professor Gangulee*: One of the lessons that you derive from the Italian Peasant Organisation is that the farm problem must be considered as a whole; then further on you say that agricultural progress is to be approached through a number of different departments, each wedded to its own particular activity. I think you there suggested that the various departments should be linked up together and should advance as a whole; is that your idea?—Yes; there is, I think, advantage in dealing with the zamindar through a single organisation.

44,662. Can you tell us how this object could be achieved in this country?—We have, in the Punjab, bodies called Rural Community Councils with much the same object as the *Cattedre Ambulanti* in Italy.

44,663. Would you like to see the Community Council idea developed?—I think it is a step in the right direction; I have no personal experience of their work.

44,664. That is a body consisting of officials and non-officials?—I think so.

44,665. Should that body be purely advisory or should it be executive in its functions?—Their relation to the cultivator would naturally be purely advisory.

44,666. What would be their relation to all the official departments?—I do not know; I have not studied the organisation.

44,667. You also make reference to various schools in the southern part of Italy and you suggest that, in India, the school should become the centre of village life. Do you think that, in the Punjab, you are moving in the direction of making the village school the centre of village life?—That is a question that I am unable to answer, not being an educational expert.

44,668. Can you suggest how your schools could become community centres in rural areas?—What the Education Department is doing at present with its two normal schools at Ghakhar and Gurgaon seems to me again a step in the right direction and a very hopeful experiment; I understand they have very promising material and are dealing with it in a very promising way.

44,669. Have you studied the Moga system at all?—I have never seen it. I should really have mentioned Moga, too, because these two schools are, I

believe, derived from Moga, but Moga, I think, deals entirely with Indian Christians whereas the other two are irrespective of creed.

44,670. Referring once more to the Italian Organisation, you suggest in the last page of your note that it is a useful antidote both to the departmentalism of the expert and to the over-centralization of the State. Do you think that the time has come in India to have such a useful antidote?—Do you mean the *Cattedre Ambulanti*?

44,671. Yes?—I have said that I think a single organisation has certain advantages and that, in developing the rural community, the Punjab Government is taking a step in the right direction but it is too soon to judge the effect of it; it is still in the experimental stage.

44,672. Would the development of that spirit of rural community councils serve as a useful antidote to the over-centralization of the State?—That remains to be seen.

44,673. On page 593 you say that rural moneylending is still the most important industry in the Province?—Yes.

44,674. On page 584 you describe the moneylender's system of business as being vicious?—Yes.

44,675. Would you explain in what way the system is vicious?—Briefly I may say it has a bad effect upon the moneylender and a bad effect upon the borrower. My reasons are given in the chapter on moneylending in my book.

44,676. We know that the rate of interest is high?—Yes.

44,677. I wanted to find out whether there was anything you particularly wished to point out about his system of business?—No more than I have pointed out in my book.

44,678. In enumerating the causes that make borrowing easy, you also suggest the great expansion of credit due to high prices and inflated value of land in this Province. Could you tell us what has inflated the value of land?—The great development of the Province that has taken place since 1900. Money has poured into the Province and it finds its chief means of investment in land. That is a phenomenon that is found in many other countries.

44,679. Do you think it is an artificial state of things?—In what sense do you use the word "artificial."

44,680. I would like to know if this inflation in land values is a temporary phase or not?—That depends entirely upon the strength of the converging factors and their permanence.

44,681. Is there any emigration from the Province?—Yes there is; that is a point of resemblance between the Punjab and Italy; in the Punjab there is a very strong desire to emigrate; as there has been in Italy, and with very much the same results. Here is a statement which relates to 12 emigrants from Jullundur and Hoshiarpur who, in 1924-25, remitted through banks Rs.54,594. Part of it was remitted in sterling and has been converted at one shilling and six pence to the rupee. In 1925-26, eight emigrants remitted Rs.32,000; that is to say in two years Rs.80,000 has been remitted. That shows the financial possibilities of emigration.

44,682. When the emigrants come back and settle down in the Province, do you notice any change in their outlook or in their standard of living?—That is a point which I am enquiring into.

44,683. You are of opinion that labour saving implements are required only to a very limited extent in a country in which employment has to be found for vast masses of labour. In that category of labour-saving implements would you include improved ploughs and mechanical water lifting

devices?—Yes: a plough is a labour saving instrument as compared with a spade: but ploughs are necessary.

44,684. You would not be opposed to the use of ploughs?—No, certainly not; I would suggest the importance of bearing in mind the relation between the plough, the soil and the cattle; that is sometimes forgotten.

44,685. You have been associated with the credit movement in the Punjab for a long time; in your note you draw our attention to the example of France and you say that there the credit movement has done little or nothing to encourage those moral qualities which have been stimulated by the Raiffeisen method in Germany. Do you think that in this Province the credit movement has done something to encourage the growth of moral qualities?—Certainly, without doubt.

44,686. On page 586 you say: "Finally it may be said that the more assistance Government gives to organization and development the less it should give to the purely business side of the movement." Is that the case in your Province?—I think, generally speaking that is the principle which has been applied. The emphasis is very much more upon propaganda, staff and organization than upon actual financial assistance which has been given to a comparatively small degree.

44,687. With regard to this question of the Land Alienation Act being an obvious obstacle to men of capital and enterprise taking to agriculture, you know of course that during the period from 1914-15 to 1921-22, that is within the last seven or eight years, the amount of land auctioned in the Crown Colonies came to the value of 271 lakhs?—I know that land was sold, but I do not know the figures.

44,688. Those auctions are open to men of all classes, without any restriction whatever?—The door is not completely bolted, but it is not wide open.

44,689. And the areas auctioned out ran from 25,000 to 69,000 acres a year. Do you not think that that opens up sufficient scope for capitalistic enterprise?—I should say probably not; it is very difficult to express a definite opinion on a point like that without going into the figures very thoroughly.

44,690. Would you venture upon any estimate as to the amount of capital which the non-agriculturalist capitalist class would like to invest?—I do not think that any one could give an estimate.

44,691. We have got the actual figures of the receipts from the sale of land by auction during the last 20 years. My latest figure is 47 lakhs for the year 1922-23. That is a very fair sum, is it not, which has been invested in canal colony auctions?—It does not seem to me a very large sum for a population of twenty-one millions.

44,692. But the non-agriculturist capitalist class is not 21 million?—They are competing with others, so you have to look to the whole population which consists of 21 million, in fact of 25 million, if you include the Indian States.

44,693. Your non-agriculturist capitalist class does not run to more than six per cent. of the population. The figures I have got here show that there are 3¾ million non-agriculturist Hindus and nearly 5 million non-agriculturist Muhammadans, which makes 8¾ millions altogether. You are including the menials?—I would not exclude the menials from the possession of land. As I say, I am not dealing with any particular class but with all classes. I would not differentiate between the menial and the capitalist, as many menials have been doing excellently.

44,694. Is it not a fact that, for the last 23 years, the Punjab Government has steadily offered land for auction to all classes?—I believe so.

44,695. Are you aware that the offering of land for auction is carried to the extreme limit of the capacity of the market to absorb the land?—I have not studied that point.

44,696. And that, when the Punjab Government have tried to sell more land, there has been a marked slump and the prices have fallen?—I do not know. I imagine that when a person wishes to buy land at an auction, he has got to have a lot of money in his pocket especially when the price of land has risen. Another point, he would certainly prefer to purchase land at a time when he considers it best to do so and not at a time when Government want to sell, because Government naturally sell when land values are high.

44,697. I have got a note here which says that an attempt was made in one year to sell a somewhat larger area but the slump in the bidding after a certain acreage has been disposed of gave warning of the beginning of a glut. What would be the minimum purchase price if a holding of two squares of 50 acres were sold?—I do not know.

44,698. *Mr. Barron*: The price of that would be about Rs.15,000?—If the minimum purchase price at an auction is to be Rs.15,000, it must naturally exclude a good many people.

44,699. But they do not have to pay the whole amount at the time of the auction, do they?—They have got to be good for it at the auction.

44,700. Do you know what proportion is demanded at the time of the auction?—I do not know.

44,701. I can tell you: it is 10 per cent., and the rest is spread over a period of five or ten years? I think a person might very well hesitate to involve himself to the tune of Rs.15,000 even though he might only have to pay Rs.1,500 down.

44,702. In some places it is smaller than that? I think that these facts which have been put forward by Mr. Calvert, if I may say so, suggest that the capitalist is placed in a privileged position as compared with the small or medium man, and I would like to know whether you are justified in differentiating between them.

44,703. *Mr. Calvert*: The phrase you use is "a man with capital"?—Yes, that is true, but in that case, the phrase must be qualified.

44,704. You know of course that large areas in the canal colonies have been purchased in auction by men of the capitalist class?—Yes.

44,705. Do you know whether they have taken to agriculture or just to rent receiving?—The information I gave in my book on that point was, I think, that on the whole they show more disposition to control their property than the agriculturist landlord; they have got the business instinct, and the business man will not sink Rs. 30,000 or Rs. 40,000 in land without satisfying himself that he will get a good return for it, whereas the agriculturist landlord views the question from a different standpoint; in buying he tends to consider his social position, whereas the other probably does not do so to the same extent.

44,706. In your note, you say at present there are very few landlords who do anything at all. Would you distinguish between zamindar landlords and capitalist landlords?—When I was down in the South-West Punjab, I was struck by the part played by the urban landlord; there seems to be no doubt that he is the only progressive element in that part of the Province.

44,707. You have, I believe, been on deputation to Europe?—Yes, for six months in 1920-21.

44,708. Twice was it not?—I was on study leave the second time and that was in 1925.

44,709. Do you consider that that deputation or study leave was of value?—It was of great value to me personally.

44,710. Do you not think that it would be a good thing if more officers could be persuaded to go on deputation to study problems there?—Yes, if they had the linguistic knowledge. You must be able to speak the language of the country you visit in a rough and ready way. I am not a linguist myself but I was able to carry on wherever I went.

44,711. You are preparing an article, I think, on the small holder. Would we be allowed to see that article when it is ready?—Certainly.

44,712. In your studies of the petty holder, the 5-acre man in Europe, did you find him attempting to subsist without animal husbandry?—He does no animal husbandry in Southern Italy but depends largely upon horticulture. What I have found is that anyone who attempts to depend entirely upon the extensive cultivation of cereals cannot expect anything more than the bare means of subsistence. If he wants anything that could be called a standard of living, he must combine cereals with some form of horticulture, or develop his arable farm on intensive lines.

44,713. Do you think that the Agricultural Departments in the three countries that you have dealt with, namely Belgium, France and Italy, devote more attention to these petty cultivators?—I have not studied the work of the Agricultural Department in any of these countries.

44,714. It is deduced from the replies received from the officers of your department that the decline in the moneylender is substantially due to co-operative societies. Is that a fair deduction?—Most certainly; there is complete agreement on that point.

44,715. Somewhere in your note, you state that rural debt has been largely lightened by remittances from emigrants?—Yes, that is in Southern Sicily.

44,716. And in Germany?—Not to the same extent. But in Southern Italy, it has had an enormous revolutionary effect. About £500 millions have been remitted in Southern Italy and Sicily in about twenty years. That is about as much as the total debt of India. It has had an enormous effect and all authorities are agreed that, in South Italy and Sicily, usury has either been killed or greatly mitigated.

44,717. Does that suggest that the question of emigration should be studied in connection with that of rural debt?—I should certainly like to see it studied, but the question of emigration in India bristles with so many difficulties that I am not very hopeful of finding a solution in that direction. If, however, the door could be opened the Punjab would be the first Province to take advantage of it.

44,718. Take the peasant proprietor in Italy; can he transfer his land with the same facility as the Punjab proprietor?—I believe not; I have not gone into the question of alienation, but I do not think it could be easier in any country than it is in the Punjab.

44,719. Do you think that the fact of the transfer of land in other countries being beset with difficulties has tended to serve as a restraint on alienation?—I cannot say; I have not studied the question.

44,720. Have you ever had applications for employment under you from B.Sc's. of the Agricultural College?—I have had quite a number of applications from the Lyallpur Agricultural College for employment in the Income-tax Department, but I have always refused to take such men in because it seemed to me that they should look for employment elsewhere.

44,721. That would be making rather a poor use of a State subsidy for education?—Yes.

44,722. Are there not still some agricultural tribes in the Province who regard agriculture as rather undignified?—I suppose the pure bred Rajput would take that view, but even with him it is weakening.

44,723. Does the Agricultural Department in Italy do any touring for propaganda purposes?—Up to 1925, they had no touring staff.

44,724. *Mr. Kamat*: With regard to this regulation of the accounts of moneylenders, may I know whether on principle, you would be in favour of some sort of regulation of accounts being introduced?—If I thought it feasible to insist upon accounts being kept in a simple, clear form, I should certainly be in favour of it; but I am very doubtful if it is feasible in a country like the Punjab.

44,725. I take it that, from your experience as an Income-Tax Officer, you apprehend difficulties with regard to the script?—That would be one of the difficulties no doubt.

44,726. Have you not got a staff to read the vernacular accounts which are written in different scripts?—Yes, we have a staff of experts to read the accounts which are kept in five different scripts. But the main difficulty is that many have got no script at all; a great many moneylenders are illiterate, not the majority, but an appreciable number.

44,727. Speaking of the consolidation of fragmented holdings, you have studied the laws on the subject of France, Italy, Germany and the United States of America?—Only very partially.

44,728. From the general impression you have formed of those laws, can you give us an indication which of those various legislations is most suited to Indian conditions?—That is a very complicated subject, on which I could not express an opinion; I should have to go into it very carefully first. Mr. Patel was sent to Europe to study that question on behalf of Baroda, and wrote a long report on the subject. If there was any question of introducing a law to consolidate holdings, the different European systems would require to be very carefully examined.

44,729. In Bombay, there is an idea of restricting sub-division to what is called an economic holding, below which there should be no partition. Do you think that this would be a workable principle?—Assuming the consent of the cultivator, I think it would be possible to work it out. It has been done in Germany. It would certainly be possible in the colonisation areas. In the colonisation areas of Germany you are not allowed, if you get land from Government, to subdivide it below a certain point, and, in 1925, Denmark passed a law to the same effect. The whole object in Europe, at present, in regard to the peasant proprietor is to establish the family farm. They are very wisely giving up the use of the term "economic holding," which is too vague; "family farm" is more expressive. The object is to establish as many family farms as possible, and to prevent their being either combined or divided.

44,730. Reverting to the Land Alienation Act, if you accept the principle that men of capital ought to a certain extent to be allowed the opportunity to do agriculture, in your opinion would it be a mitigation in reply to their grievance to tell them that they can go to a particular colony and there, and there only, be allowed to do farming?—It is certainly a mitigation; undoubtedly it is a partial opening of the door, as the figures given to us by Mr. Calvert show.

44,731. If a man like Sir Ganga Ram, for instance, wants to start an experiment in dry farming on American methods in the interest of dry farm cultivation, would it be an advantage to tell him to go to the canal colonies and not to a dry area of the Province?—Clearly not, but no one would give him that advice.

44,732. Then what is the solution under the Act?—The solution would be to give him land elsewhere, which I suppose would not be beyond the power of Government.

44,733. *Mr. Roberts*: In answer to Mr. Calvert, I think you said graduates holding the B.Sc. of the Agricultural College apply for posts in your department?—A certain number; not many.

44,734. I believe the pay is higher there, and the prospects better, than in the case of the Agricultural Department?—I do not know what the prospects are in the Agricultural Department.

44,735. At any rate the initial pay is higher. You start at Rs.250, I believe?—Yes. It is entirely a matter of pay; it is not any enthusiam for income tax.

44,736. With regard to these land auctions, is it not a fact that the price given for land is so high that generally the return is only about 3 per cent.?—That is an extremely difficult question to answer precisely, but such inquiries as I have been able to make suggest that, in a Province like the Punjab, the return would be somewhere between 2 and 3 per cent., and perhaps only averages 2½ per cent., taking the Province as a whole.

44,737. Is not that in itself an indication that there is a very great desire on the part of non-agriculturists to get land?—There is a very keen desire on the part of everyone in the Punjab to get land.

44,738. Do you think, if only the farmers themselves were competing, the prices would reach these uneconomic levels?—I think one advantage of the Land Alienation Act is that it tends to keep prices down. That is an important effect.

44,739. That is in the ordinary settled tracts, not in the case of auctions?—Auctions depend entirely on market conditions. When I said I thought the percentage would be about 2½ I was speaking of the Province as a whole, not of the canal colonies; I should think it was probably higher there, but I have not considered the question.

44,740. Do you consider the high price of land an advantage from the point of view of attracting capital?—In a progressive community, I think it a disadvantage, because in a progressive community you assume a desire to progress, and if a person has to pay a large sum for his land, it leaves him little to develop that land with. In an unprogressive community that consideration does not apply.

44,741. Is it partly due to the fact that there is no other opening for investing capital?—Very largely, and also to the social position that attaches to the possession of land in this country. That is very strong indeed.

44,742. Speaking generally, you would consider it a good thing to attract brains (whether from the agricultural or non-agricultural tribes) and capital to agriculture?—I was very much impressed, in reading "The Wealth and Welfare of the Punjab" by the fact which the book brought out very clearly that in the case of other countries which have progressed that has been a very important factor in their development. It was that idea which led me to consider the position of the Alienation Act in this Province.

44,743. How do you think a higher water-rate would affect the problem? Supposing in the case of a new tract it was decided from the beginning to impose a much higher water-rate, would that tend to correct the factor of high price?—I do not know. I have never studied the question of water-rates.

44,744. In two places in your note, you draw attention to the importance of growing more fodder. You state that one result of a different system would be more fodder and more cattle?—Yes.

44,745. On this question of cattle, I should like your opinion on the subjec of whether the Punjab has sufficient cattle-power?—I ought not to expres an opinion on that point, because I have not studied it, but my impressio if that if they were all good, there would probably be enough; but many o them are not earning their keep.

44,746. You may get defective cattle-power from a large number o inefficient animals or too small a number of good animals?—Yes, and I woul rather have the latter state of affairs than the former; the problem woul be much easier to solve.

44,747. On the question of getting more fodder, you draw the conclusio that it is an argument for economy in the use of water?—I gather (I am not an expert on this point, of course) that the extent to which you can use fodder crops in your rotation depends very largely on water. If this is the case, economy of water becomes very important.

44,748. Do not you think the whole position of the farmer compels him t economise water? There is every incentive for him to do so at present?— Possibly there is, but I have very often heard the reverse stated; it is often said that water is wasted, but that is a question for the irrigation expert.

44,749. I wondered whether you had studied the question of intensive cropping at all?—At Lyallpur they told me they could get five crops in three years with a rotation of wheat, summer fodder, gram, cotton manured with farmyard manure and *senji*. The fodder factor is the important one.

44,750. In that rotation, the fodder proportion is much higher than usual? —The ordinary rotation in the canal colonies is wheat, wheat and *toria*, cotton, wheat. Wheat is very rarely manured. It is apparently difficult to manure wheat to the same extent as other crops because it is grown over such a large area. By introducing leguminous crops the manuring becomes easier, as the leguminous crop itself acts as manure. I was very much struck by the tremendous emphasis now being laid in Italy on the development of the fodder and leguminous crop as compared with the development of cereals.

44,751. One of the points in regard to this Lyallpur rotation of 166 per cent. intensity which you mention is that it can only be done with a high proportion of fodder crops?—I asked them at Lyallpur why this could not be applied to other parts of the Province and was told that water was the difficulty.

44,752. With regard to the landlord system in Western Punjab, is not the economic position there ruled by the water question?—Nothing can be grown there without irrigation of some kind, either from wells or canals. You cannot grow a crop in Muzaffargarh simply by rain.

44,753. And the irrigation there is very precarious?—Very; it is not perennial; it is only inundation, which depends on what happens in mountains a thousand miles away.

44,754. There are not even permanent headworks; it is liable to big disasters?—Yes.

44,755. Do you not think those conditions generally tend to form the landlord type or leading man who dominates the rest? Is it not the fault of the conditions more than of the people?—That there are landlords there?

44,756. Yes?—It has puzzled me why there should be landlords in one part of the country and not in another. I think you are right, and that where you get conditions of insecurity, whether political or economic, you require a person in a strong position, in the case of political insecurity to protect everyone in the neighbourhood and in the case of economic insecurity to protect himself.

44,757. In connection with implements, you mention a principle I could not quite follow. You say there is so much labour available that no

attention is demanded for labour-saving appliances?—No, that the amount of attention depends on the labour factor. It is no use urging a man who has only 5 acres to buy a thresher or reaper.

44,758. I was thinking more of the principle. I am looking at your reply to question 14 on page 585, "In a country in which employment has to be found for vast masses of labour——" etc. Would you regard that as a sound business principle?—With a population of 320,000,000, it is rather a formidable proposition to find occupation for everyone. The problem of the family farm (or the economic holding, if you prefer to call it that, is not only to find food and clothes and housing but also enough occupation. The problem has two aspects; you may be able to find enough food but not enough occupation, or *vice versa*.

44,759. If you accept a principle of that kind, it seems to clog all possibility of progress?—It simply means that progress must take other lines. In this Province, as far as I can see, very little has been done to help the small man, the man with 5, 6 or 7 acres. The man with 20 to 50 acres has received much more consideration than the man with 5 to 15.

44,760. In the case of the small man, it is very likely an economic question whether it is not better to do something in regard to consolidation than in regard to new crops and so on?—It is useless to think of real enduring agricultural progress without consolidation. That is absolutely vital.

44,761. If two classes of people were competing against each other, and one recognised the law of the survival of the fittest and the other did not, what would happen?—I think the former would soon be in the bankruptcy court.

44,762. The first would look for new outlets?—He would have to do that or sell his machinery and cut his losses. Wherever the population is great, as in parts of Southern Italy, you will find the tendency is much more towards horticulture, where the labour factor is the most important, than towards mixed farming, in which capital is as important, or even more important than labour.

44,763. Do you think the Punjab is ready for legislation on consolidation? —I should imagine that in districts like Jullundur where the field has been prepared, it is.

44,764. You would favour permissive legislation?—I would go just as far as it was possible to go with the consent of the majority of the cultivators; I would not do anything without the consent of the majority.

44,765. *Sir Henry Lawrence*: I think you say you are in favour of opening the doors of emigration wider?—I think I should be.

44,766. Is there in the Punjab an effective desire to emigrate?—Yes.

44,767. To emigrate within India or outside India?—Outside India; the tendency to emigrate is a very marked feature in the Punjab but has necessarily been very much restrained.

44,768. In what country is that strain of emigration tending to settle?— It has gone to the Far East, Australia, Canada, the United States, Peru, Mexico, East Africa.

44,769. Are they to be found in Peru and Mexico?—Yes, I have met people who have made their money in Peru and Mexico.

44,770. *Prof. Gangulee*: Do they go to British Guiana?—I do not know, but they go to almost every field you can think of. The Punjabi is extraordinarily enterprising; he is very like the Italian in that respect; he goes wherever he can get a living.

44,771. *Sir Henry Lawrence*: Does he go to East Africa?—Yes, but I think most of them go to the Far East and America; America is the place

it seems to me everything depends upon increasing the supply of water and manure; ultimately everything depends upon these two factors.

44,794. Does not the rigid fixing of the date of paying the revenue affect the position of the cultivator and compel him to sell his produce earlier than he would otherwise do, or borrow from a money lender?—I should say not to an appreciable extent.

44,795. Is not that the case with regard to small landholders and peasants?—You will no doubt be able to find instances of that but after looking into that question I came to the conclusion that land revenue and indebtedness have no real connection. Sometimes people borrow to pay their land revenue hoping that it will be economically profitable to do so because prices may rise.

44,796. Do they not sometimes sell their produce earlier than they otherwise would?—Not to an appreciable extent.

44,797. Could not some satisfactory system be devised by which peasants who will not trust their money to banks and institutions of that kind could nevertheless obtain a little interest on their money? What was in my mind was that they might buy cash certificates which would be in payment of the next five years' revenue, so that by paying Rs.775 now they would be credited with a thousand rupees in five years' time?—Yes.

44,798. Some system of that kind could be worked out by means of which, when they have a bumper crop, they could pay the next five years' revenue in advance and receive interest at the rate of 4 to 5 per cent. In that way the problem of the rigid date of payment of revenue would be solved?—I think that problem is being tackled on those lines by the Co-operative Department; a certain number of co-operative societies have been formed for payment of land revenue.

44,799. That system has been thought out?—Yes and an experiment is being made now.

44,800. *Sir Thomas Middleton*: You make out a strong case for the appointment of a representative from India on the International Institute at Rome. Would it be true to say that India has only lacked a representative for the last ten years or so? You had a representative there before that time in Sir James Wilson from this Province?—Yes; he represented, I think, the whole of the British Empire, and of course he had Indian experience.

44,801. Your case is strengthened by the fact that at the moment you have a British Civil Servant representing the whole Empire at Rome?—Yes, Sir Thomas Elliott was himself in favour of India having a separate representative. He said that it would strengthen his own position to have one.

44,802. I think that, in the early days of this Institute, the late Sir Edward Buck gave a good deal of attention to the development of the work?—I think he represented India alone, but I am not sure.

44,803. *Sir James MacKenna*: He was the first representative.

44,804. *Sir Thomas Middleton*: Following him you had a representative of the British Empire in Sir James Wilson?—Yes.

44,805. So that it is since 1917 that the need for a special representative for India has arisen?—Yes.

44,806. There is a very interesting point raised in your note on the experience of these Italian peripatetic teachers; this is that they find in some parts of Italy very little difference between the quality of literate and illiterate pupils?—Yes.

44,807. Have you discussed that point at any length?—Not in detail, but more than one person told me that that was his experience on the technical side.

44,808. Illiteracy in India is assumed to be the great obstacle to further progress?—Yes.

44,809. And here in Italy they have actually found the illiterate pupil learning readily from their peripatetic teachers?—Yes.

44,810. I take it that the courses of study were lecture courses?—Yes, short lecture courses.

44,811. The benefit therefore must have been derived from discussion and from memory?—And demonstration; it is all based on demonstration. I think that the Italian peasant is probably quicker in mind than the Punjab peasant, so that it might not apply in the same way to the Punjab.

44,812. Were these courses largely practical?—I gathered they were, but I did not attend any of them. The object was to make them as practical as possible and how far they succeeded in that direction I do not know.

44,813. There is another point with regard to Italian experience in this significant quotation which you give as "The present educational course kills the peasant in the pupil"?—Yes; if that is so, it is because the educational system tends to set their minds towards the town instead of back to the village.

44,814. In other words, the Italian educational system is the system that has been common both in rural and urban centres in all countries up to the present time?—Yes.

44,815. And it is only now that efforts are being made to differentiate?—The problem was certainly acute in Italy on this ground. I do not know whether their primary school system is better or worse than the system which obtains here.

44,816. I do not suppose they have attempted anything more than the three R's?—I think it is very elementary. The complaint here is that the system of education imparted tends to draw the boys away from the land. An educated *zamindar* was asked why the educational system tended to draw the boys away from agriculture, and he said that the easier life led at school set a boy's mind against the harder life of agriculture. I remember myself asking a boy in a school whether he would follow the profession of his father who was a *zamindar*, and being told no, as it meant a lot of *taklif* (trouble), and that he wanted to be a *babu* and sit and work at a table.

44,817. Did you find out during your European tour whether the same difficulties arose in say France or Germany?—I have not toured in France.

44,818. You point out that the development of the research station in Italy has been by way of crops. I think that is probably accounted for by the fact that in a country like Italy, development of agricultural research in the early stages is easily secured by working on special crops?—I do not say that it is better, but only mention it as a different system.

44,819. Their system is comparatively recent?—In Italy they are not at all satisfied with what they have achieved in the last twenty years.

44,820. The live movement in Italy then I take it, is the circulating teacher?—Yes, I was very much struck with what I say in Sienna, but not with what I saw at another place. It is all a matter of personnel.

44,821. In Italy, 7½ acres is regarded as the minimum size of the family holding. You point out that with a holding of less than that amount it is impossible for the cultivator to adopt any rotation which might be called a scientific rotation, he would have to work for safety?—I think you are probably referring to what someone said to me with regard to this. He was an expert at the International Institute, and he told me that he thought

they like to go to. For instance, I have a lame *chaprasi* who is a typical uneducated *zamindar* of the Jullundur District; I once took him to Calcutta and asked him if he would like to see the big steamers. He replied: "I know them, I have been to Vancouver." That is typical of the enterprising Punjabi.

44,772. When they go far abroad do they take to service or farming?—They do all kinds of things.

44,773. Is the Punjab Government taking any steps to increase the possibilities of emigration?—That I do not know.

44,774. Do you think some such steps might be taken?—That I cannot say yet. One of the questions I want to investigate is the effect of emigration upon the returned emigrant. I am collecting information on the subject, but until I have gone into the matter further, I cannot say whether it is beneficial; all I can say at present is that, if the doors were open, the Pujnabi would go; whether that is to the advantage of the Province or not is another matter.

44,775. The returned emigrant is not always desirable?—He is often a difficulty politically and he may be a difficulty economically, too.

44,776. Notes have been furnished to the Commission by Mr. Moreland whom no doubt you know; he is of opinion that one of the greatest drawbacks to improvement of the status of the cultivator is the lack of the will to live better; do you think that applies to the Punjab?—Yes, I think it does; it is a drawback. I doubt whether it has the same force in the Pubjab as in other parts of India, but it is there undoubtedly.

44,777. You think generally in India there is a marked absence of desire to live better?—I doubt whether that is peculiar to India; I think it is a characteristic of all hot climates, and that you will find the same thing in Sicily and South Italy. The factor is present in the Punjab, but I do not think it is so strong as in other parts of India, because the people are pretty virile up here.

44,778. What do you consider is the most effective method of altering this particular phase of the psychology of the ryot?—I am not absolutely clear in my mind that we should be wise to alter it; it is a doubtful point.

44,779. Do you agree with the opinion of the late Mr. Edwin Montagu that it is desirable to rouse his pathetic contentment?—I think that is open to question; I think much depends upon what you are going to give him in place of his present contentment; for instance, if you are going to substitute the material progress that you have got in Europe, I should say on the whole, leave him where he is. I mean progress in Europe has entailed a vast industrial expansion, the growth of very large towns, a very heavy rural exodus and a dull bored village. We have none of those evils at present. (I have heard it said that the zamindar suffers from boredom, but personally that is not my impression.) I think there is a danger that, if you proceed too quickly, you may be moving along wrong lines and may regret it afterwards.

44,780. You do not agree that the villager sets to work to steal his neighbour's cattle and his neighbour's women from a spirit of boredom?—No, certainly not; that is enterprise; the Punjabi is most enterprising.

44,781. You do not think the jazz band and the "Charleston" will save him from these crimes?—Personally, I would much rather he stole his neighbour's cattle. This is a very important question upon which you have touched, because at present in Europe, and especially France, it is a vexed question to which economists are devoting some attention; there are two schools of thought with regard to it; the conventional and usual point of view is that it is better to try and enliven the village on the lines of the town; but there are some writers who say this is wrong, that what

you ought to do is to preserve a vigorous Spartan spirit in the village, because life for the cultivator is necessarily a hard one, and if you soften his life you make him less disposed to cultivate. There are those two points of view; one of them has been very eloquently stated by a French writer, M. Vincent.

44,782. *The Chairman*: Which would you choose if you were standing for election in a rural constituency?—If I wanted to get in I should choose the first, but, personally, I think the second is the more important.

44,783. *Sir Henry Lawrence*: Mr. Moreland tells us further that of all the items of waste in the countryside the greatest waste of all is the waste of labour owing to the periods of under-employment in the present agricultural system. Does that apply equally in the Punjab?—Yes, if you are using the word "waste" in the sense that labour is lying idle which might be used. Estimates differ as to the amount of time that the agriculturist has to work in the Punjab, but outside the colony areas and the more intensively cultivated areas, I should not think he is occupied for much more than 200 days, and possibly not for as much as that.

44,784. Do you consider that these periods of idleness are injurious to character?—I should think almost certainly they are.

44,785. And are also economically injurious?—Certainly.

44,786. Mr Moreland suggested as the most suitable form of employment the cultivation of sugar cane crops. That has also been advocated, I believe, in the Sugar Committee's Report. Do you regard that as a valuable development in the Punjab?—Very; I personally should be in favour of anything that led to more intensive cultivation, partly because it will give the cultivator more food, and partly because it will give him more work; from that point of view, the cultivation of sugar cane would be valuable. It would also increase the supply of sugar in the country and would lead to less being imported, which would be another advantage.

44,787. Mr. Moreland, using a curious phrase, describes the sugar cane crop as a labour savings bank?—What does he mean by that?

44,788. The peasant puts into it days and hours of work which would otherwise be wasted and he draws the value of his labour, often with very good interest when he sells his produce?—I see what he means and I certainly agree with him.

44,789. So that anything that could be done to increase the area under sugar cane ought to be done?—I would not agree to that without qualification, because my view is that you must look at the holding as a whole. If I agree to it, I should be agreeing to the whole of a man's holding being put under sugar cane, if it were possible to do so.

44,790. Not nececssarily because sugar cane must be in rotation?—It might mean the whole of his holding being put under sugar cane in rotation; I should not agree to that. I am certainly in favour of growing sugar cane, subject to its being combined with other crops which have to be grown and subject, too, to the general interests of the holding, for it is not the only factor.

44,791. *Sir Ganga Ram*: Following up Sir Henry Lawrence's question, if you increase the area under sugar cane, the other crops would be deprived of water because water is not given with reference to the quantity of any particular crop; it is given on a certain formula?—I think more water would have to be found.

44,792. The supply of water is already short enough?—There is plenty of water available, but every available drop of water in the Punjab is not being used in agriculture.

44,793. The increase of sugar cane depends on water because sugar cane requires more water than any other crop?—From the farming point of view

it was very doubtful whether a scientific rotation of crops could be introduced on a holding of less than 7½ acres. The inquiries I have made suggest that you cannot have a family farm under 12½ acres if cereals are going to play any important part in it.

44,822. Would you agree that, in India, it is the minute subdivision of holdings which is the greatest difficulty in the way of introducing any changes in agricultural improvement?—Yes, it is due to excessive population which is really the root difficulty of everything.

44,823. We have got down to the point at which the man must adopt some subsistence methods of farming?—Yes.

44,824. With regard to the economic value of subsistence farming, I take it that the real value so far as the individual is concerned, is that it eliminates the middleman's profits; he is himself the consumer?—Quite; and also it gives him a certain security.

44,825. But the big economic advantage is that it eliminates the middleman because he is himself both producer and consumer?—Yes.

44,826. And therefore on the small holdings where the margin is extremely small it is the successful system?—Yes.

44,827. Would you agree that whereas subsistence farming may be a safe thing for the occupier, it is not in the interests of the non-agriculturist members of the nation?—I think that might very well be argued.

44,828. It has in fact been strongly argued in certain other countries?—When you have to balance the interests of one class against those of another, it is very difficult to say where the true balance lies. Broadly speaking, you are probably right. Town-dwellers are interested in low prices.

44,829. Not only are town-dwellers interested in low prices, but trade, exchange and commerce generally depend on a surplus from the land?—They are interested in the economic aspect of the matter, whereas the farmer himself is equally, and perhaps more vitally, interested in the social aspect. It is the social aspect of farming which is so important. It is essential to a man who has been cultivating land all his life to go on having land to cultivate.

44,830. You referred to the influence of landowners on the progress of agriculture, and you were disposed to doubt whether, in the Punjab, there was much to be anticipated from this agency?—No; what I said was that not much had been gained up to now. I think much more may very well be anticipated from them if they are appealed to in the right way.

44,831. I should like to point out that in Britain, where the landowner has set an example in that respect, it is only since the first half of the eighteenth century that his social obligations have been recognised, and in Germany it is only since the first half of the nineteenth century, so that the Punjab is not far behind?—It is not at all behind most of the world. It is not behind Roumania, for instance.

44,832. It is only 200 years behind Scotland and 100 years behind Germany?—I should say it was only 100 years behind Scotland and 200 behind England. Scotland and Germany both began about the same time.

44,833. No, Scotland began about 1715-30 and Germany about 1815-30?—I was thinking of the great development of the borders, which began about the close of the eighteenth century. The Punjab is not behind the rest of the world.

44,834. There is no reason why, because you happen to be somewhat behind at present, we may not find the same influence of the owner appearing in the Punjab, and later in other parts of India also?—Yes. I think that now and then there are signs that landlords are beginning to realise their responsibilities.

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44,835. On page 587 of your memorandum, you point out that in India, the personal factor has quite unusual importance, and you emphasise the fact that great care will have to be taken in selecting and training the men who are to deal with the cultivator. We have in India the means of training in the shape of college buildings and experimental farms, and we have an ample supply of raw material in the form of good students. The question is whether we are taking enough time and trouble to train these men in view of the very difficult task before them. You point out how very necessary it is that the cultivator should be approached by someone who can gain his confidence?—That is essential.

44,836. I do not know whether you have given any attention to the amount of training that is being provided for demonstrators and other workers in agriculture in this country. If you have, I should like to hear your views on the matter?—No, I can only speak with some small experience of the Co-operative Department, where in the past, it was considered that from one to two years' training was necessary before a man would be of much use to the Department.

44,837. Would you agree that generally the conditions in India are such as to warrant very great efforts being made to provide suitable training for these men?—Certainly.

44,838. You point out that among the moneylending classes there are both good and bad, and you express the view that, in the Punjab, the moneylender is possibly doomed, and that his short supremacy of fifty years is coming to an end. I am afraid we have not found indications of a similar doom in other parts of India; it looks as if his life would be a long one there?—I am assuming that the Punjab is allowed to develop on present lines, and that it definitely emerges from the mediæval into the modern stage of civilisation.

44,839. Assuming that we have great differences in character among moneylenders, do you know of anything that could be done to assist the good moneylender to improve his position and to change his methods into those which used to be adopted in England by the private banker?—The only way would be to turn him into a bank. It is the personal relationship (which constitutes the essence of moneylending) which is bad. A bank is to some extent impersonal.

44,840. In the development of banking in England there was a great deal of personal relationship; a hundred years ago it was the rule?—Yes.

44,841. That has gradually been developed into the joint stock banking system, and one hears very frequently the complaint that the old state of affairs was better than the present one?—There was a high standard of education behind the private banker which you do not find behind the moneylender. The private bankers were not out to exploit their clients, as people are in every line of business where there is a lack of education. Where there is no education, there is no sense of social obligation. For the last fifty years or more the moneylender's exploitation was unchecked, and was indeed assisted by the system of law which we set up in this country. I do not think that there is any means of reforming the moneylender.

44,842. You do not think there is any means of converting the better type of moneylender into something corresponding to the private banker we had in England a hundred years ago?—The better type is probably to be found in the towns. Under urban conditions it might be possible to do what you suggest, but it is not possible under village conditions, unless the moneylender again becomes the servant of the village, as he was before we came here, and as I understand he still is across the frontier in Afghanistan.

44,843. You have examined all the methods that have been tried in other countries to restrict usury, and it would almost seem we are up against an impossible problem in trying to regulate the moneylender by law. The final

conclusion of a Swiss rural economist to whom you refer is that for that country there might be a regulation imposing a maximum rate of interest and regulating the amount of a loan. I think you are satisfied it would be impossible effectively to impose a maximum rate of interest?—I think so, and I think that has been the experience of other countries, although France still maintains it.

44,844. France and America are the two countries which have tried to do it?—France had to relax it in the case of business during the war and has not reimposed it. The trouble is that it is so easily evaded.

44,845. The only way of making the rate of interest reasonable is to subject it to the competition of societies like co-operative societies?—Yes, and to make the market easy for productive loans and difficult for unproductive. That is a very important point. If you can combine the productive loan with easy credit, you will have solved the problem, but there is grave danger in easy credit when no distinction is made between productive and unproductive loans.

44,846. Could anything be done by educating the moneylender so as to get those who are interested in the development of the country to exercise greater discrimination in their loans? At present, you tell us there is no discrimination at all?—Very little. I give an instance in my book of where a moneylender did discriminate. A number of people from the same village came and asked a moneylender for a loan. He told them he wanted a certain amount of a particular kind of weed (*jantri*) to re-roof his cattle shed, and asked them if they could get it for him. Five out of the seven replied "We can give you any amount you like; it grows on our land." The other two said "We have none on our land because it interferes with our crops, but we can get some for you." The moneylender thereupon lent money to the two but refused a loan to the other five. That type of moneylender, however, is very rare.

44,847. That kind of discrimination by the private banker in Britain had a very great effect in promoting the productive use of money in agriculture in the early days of agricultural development?—If you have to pay an average rate of 15 per cent. on borrowed money, the field of development is extremely limited, but if you can bring down the rate of interest on productive loans to six or seven per cent. you will have much wider scope. That, broadly speaking, is what co-operation does.

44,848. The co-operative societies generally limit their short-term loans for productive purposes to something like three years?—The period may be very much less.

44,849. The maximum is three years?—It depends very much on the quality of the bank. There is no maximum fixed. Many loans go on for five or six years, and I dare say some go on for even more.

44,850. I questioned one or two societies about that point and they said their practice was to limit a loan to three years, but that they would renew a loan?—That comes to the same thing. In English banking I think there is technically a limit of six months, but the loan is generally renewed automatically if the security is good, though not indefinitely, of course.

44,851. The worst feature of the moneylender's loan is that the term is indefinite; the longer the term is, the better he is pleased?—Yes.

44,852. Can you see any means by which legally the term of the loan could be restricted?—No.

44,853. It could be laid down that the loan was not to be for more than three or five years, but I suppose the conditions could not be enforced?—I do not think it is possible in a country like this.

44,854. *Mr. Barron*: You say the Land Alienation Act was passed primarily to save the weaker cultivator from expropriation, and in this it

has succeeded. I think when the Act was passed the cry from both the big and the small men was "The Government has saved us"?—I was not in the Punjab when it was passed, but that was the object, and in that object it has succeeded. The attitude now is that Government has saved them.

44,855. Have you heard any complaint from the weaker men that they are no longer being saved?—No.

44,856. You go on to say that, owing to the Act, many agriculturists are now in a position to buy land. Is there any harm in that?—No.

44,857. It is probably a good thing if the strong landowner can become stronger still by buying land?—If I am going to sell land, I naturally want the highest price I can get. Assuming it is good for me to get the highest price, it is a disadvantage to me that there is an Act which prevents some people bidding for my land.

44,858. But you have no objection to the strong landowner becoming stronger? There are certain weak men who are bound to go to the wall, whatever is done for them?—I think that is probably an advantage.

44,859. It is good for the big man to get bigger, because he is able to introduce improvements which the small man cannot hope to do?—There is one big landlord who, I was told by the Settlement Officer, has doubled his acres since the Alienation Act was passed. I should doubt whether that was to the advantage of that particular estate. It varies with the personal factor.

44,860. You say there are signs that big landowners are beginning to take an interest in their land and go in for improvements?—Yes.

44,861. If this process goes on, there may be more men of that type?—I think there will be.

44,862. *Professor Gangulee*: Under the Board of Economic Enquiry, the investigations are carried out by paid investigators?—Yes, who are only employed once, for the purpose of a particular investigation. The question of whether they should be re-employed has been under discussion recently.

44,863. Are they recruited from University students?—They have all passed through some stage of the University, and nearly all, if not all, of them are graduates.

44,864. But you are not satisfied with their training? You say the investigators are entirely untrained?—When they undertake the investigations, the only training they have had is the academic training of their school and college. I do not think that is a satisfactory position if you want to get reliable information in a country where it is exceedingly difficult to get it. It would add very much to the confidence one could place in information if one knew it had been obtained by a trained agency.

44,865. So that at the present time you have no arrangements to train them?—No; they come in raw and they leave after they have been employed in one investigation. I think I am right in saying that why they are not employed again is to avoid their thinking they will have the right to be employed permanently.

44,866. Again in the course of enquiry that experience is lost?—Yes, that experience is lost; I am personally in favour of having trained men.

44,867. How is this Board of Economic Enquiry financed?—I think it is financed entirely by Government.

44,868. Is this a permanent Board?—Yes; I do not think it has been appointed for a fixed number of years; its permanence is contemplated I think. At the same time, there is nothing to prevent its being dissolved at any moment so far as I know.

44,869. So that in this economic enquiry which is largely on agricultural matters, you are in touch with the Agricultural Department?—Very much so; we are in close touch.

44,870. In answer to Sir Thomas Middleton you said the population is increasing; do you mean by that that the pressure of population on the land is excessive?—It all depends on what you consider is the right standard of life; in terms of the present standard of living, which is in many places very low, it probably is not excessive, but in terms of the standard of living which is coming more and more to be regarded as the minimum standard of living for a civilized being, I think it is excessive.

44,871. *Sir James MacKenna.* I suppose if you send an Indian representative to the International Institute at Rome you would expect the Government of India to support a fully equipped office?—Yes.

44,872. The experience has been that some sections have suffered from poor staff, worn-out typewriters and so on?—Yes, they are under-paid.

44,873. Presenting a very tawdry effect?—Yes.

44,874. What sum do you think would be sufficient to pay for adequate staff and equipment? Would Rs.50,000 a year be sufficient?—I think that would probably be ample; it is difficult to say.

44,875. Perhaps two thousand pounds a year?—I should think you could have for that amount of money a very fully equipped staff at Italian rates. The salaries generally paid there are quite inadequate; when I was there there were educated Englishmen working at £100 or £150 per annum. Since then the salaries have been increased. If India is to be represented, I think it ought to be done well.

44,876. *Sir Thomas Middleton*: These badly paid Englishmen of whom you speak were in the service of the Institute?—Yes.

44,877. They were not in the service of the representative of the Empire?—No. I should be in favour of having an office under the Indian representative; I do not think he would want a big office; but all depends on the number of enquiries from India that he would have to deal with.

44,878. *Sir James MacKenna*: I suppose it would cost at least £2,000 per annum?—I have not worked it out; I should think you could do it for that.

44,879. Of course, there is always difficulty in getting money out of the Government of India for these things?—Yes. I have been asked a good many questions about the Land Alienation Act, and should like to say that my position to-day is what was expressed in my book, namely, that the time has come to re-consider it in regard to the more advanced parts of the Province. I am not prepared at present to commit myself to an expression of opinion as to whether it should be modified or not; more enquiry is needed.

(The witness withdrew.)

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Colonel C. WALTON, R.E., D.S.O., Agent, North Western Railway, and Major R. E. GORDON, R.E., M.C.

Oral Evidence.

44,880. *The Chairman*: Colonel Walton, you are the Agent of the North Western Railway?—Yes.

44,881. Major Gordon, you, I think, were an Officer placed on special duty to enquire into the possibility of financing the erection of grain elevators?—Yes.

44,882. In India generally or in the Punjab?—In the Punjab.

44,883. From the North Western Railway we have the memorandum* on the North Western Railway sphere and we have also a Report entitled: "A Report on Grain Elevators."* The memorandum is prepared by you, Colonel Walton?—(*Colonel Walton*): The memorandum was prepared under my direction by various officers of the North Western Railway.

44,884. Colonel Walton, will you speak on both points, the general railway situation and on the grain elevator question?—I should like to make a fairly full statement about the elevator question.

As regards the memorandum on the North Western Railway sphere, it explains the present position of the railway; it also details the extensions that are being made to it, and those we propose to make within the next few years: it also gives a description of the Port of Karachi, which is the port for the Punjab in Sind. These aspects are fully detailed in the memorandum, but there are various points in the report on elevators about which I should like to make a statement.

I wish to preface my remarks by explaining the origin of the present investigation by Major Gordon into the elevator question as I think there is a danger of the idea prevailing that the railway has undertaken this investigation because of the benefits that might accrue to the railway; this is in no way the case, as the railway anticipates that the adoption of elevators would entail heavy expenditure in adapting wagons to bulk carriage of grain and seeds and does not anticipate any appreciable financial advantage to the railway. Should it, however, be found that there are financial gains to the railway, whether the railway works the elevators or not, it must be remembered that the North Western Railway is a State railway and any gain in net earnings accrues to the benefit of the general public and is not distributed in the form of dividends.

My foreword on Major Gordon's report explains briefly how the railway came to undertake the present investigation; put briefly, it is because the railway is perhaps the organisation most in touch with the various interests involved; we go down to Karachi, and in that way we are in touch with people at the port more than the Punjab Government. It is not because the railway is a determined advocate of elevators, but it seems the opportunity of a generation for the Royal Commission to give a pronouncement on this contentious question which is raised from time to time without any finality. I must emphasise that though the Railway Board approved of Major Gordon's investigations being undertaken, they have not yet examined or given any opinions on the report. Whatever, therefore, Major Gordon or I may say must be taken as our personal views, and it must be clearly understood that the State railways have no definite idea, at any rate at present, of undertaking this business themselves.

*Not printed.

India is the only civilised grain exporting country, as I understand, which has not yet adopted the elevator system, and if it is a system that is adaptable to India, as it is to other countries, then I suggest that the whole question should be thoroughly ventilated.

In Section VI of his report, Major Gordon has shown that there is much *prima facie* evidence to warrant elevators being adopted in India. I shall refer to that shortly later.

Sections I to IV of Major Gordon's report describe the elevator system shortly but clearly and I think it is not necessary to recapitulate the ground which he has dealt with in these sections.

In Section V Major Gordon has dealt with the advantages of the elevator system in the Punjab and the obstacles thereto. The way in which I view the proposal is that, provided the elevator system can be shown to be likely to pay, or, at any rate, not to cause excessive loss to revenues, the proposal should be judged simply and solely on the extent to which it may be expected to "elevate the cultivator" and benefit the man of small means. If, as Major Gordon claims, the elevator system is workable and will contribute the following main advantages which he mentions in Section VI:—to safeguard the cultivator from exploitation, to give him an incentive to grow the best grades of wheat, bring him in closer touch with his markets, avoid loss in handling or through damage and loss by weevil, vermin or weather, and ensure safe storage of the people's food without deterioration, then I venture to suggest that the elevator system is one which calls for serious and sympathetic consideration by the Royal Commission.

As regards the obstacles to the adoption of this system, I think, it will be generally acknowledged that there is a lamentable ignorance of the whole subject in this country, which alone would account for the absence of any demand for the installation of elevators. The cultivators, the men of small means, are the vast but voiceless section of the population of India; and it is no wonder that those most likely to benefit by the scheme have been debarred by ignorance of the subject and general illiteracy from representing their own interests. On the other hand, the interests concerned in the grain trade are naturally conservative in a sphere in which they are already satisfied with the existing conditions of trade.

As some of the replies to the Questionnaire have indicated the prevalence of the idea that the construction and working of the elevators should be in the hands of the railway, I must emphasise that the railway is not at the present moment prepared to accept this responsibility without detailed examination. There must be divergence of opinion as to whether the construction and working should be in the hands of the Government or of private firms; if it is in the hands of the Government, the saving accruing can be used to cheapen the working in subsequent years or to form a reserve for bad seasons.

Marketing is a matter on which I cannot give any useful opinion, except to say that there seems no reason why this should not be left to private enterprise and some arrangement made with banks and co-operative credit societies to make advances against elevator certificates.

In my opinion a system of country and terminal elevators in the Punjab would be quite a workable scheme without a port elevator or terminal elevators in consuming centres in the United Provinces, because elevators can discharge into bags automatically weighed, and, therefore, bulk transport from an elevator is not essential. To a certain extent bulk grain could be received at a non-elevator consuming station, so long as there is room for unloading by hand and bagging.

In fact, the first stage of any scheme as I see it would be to instal a sufficient number of elevators in the Punjab, and it would be a mistake to start with a port elevator in advance of a system of elevators up country; that is the feeling I have as the result of this investigation. The

port elevator, I think, must follow, as export is an essential part of the grain trade, and it is not conceivable that the port should stand out indefinitely.

As the grain trade at present dispenses with grading by working to a "fair average sample," it seems possible that an elevator system primarily intended for internal movements could similarly do without it, but one of the great advantages of the system would thereby be lost. There must be difficulties in ensuring correct grading continuously, but the difficulties which have been got over in other countries should not be insurmountable in India.

Major Gordon has put forward alternative tentative schemes, the most modest of which entails a capital cost of just over a million pounds without the port elevator, and entails the construction of 78 elevators of an average capacity of 3,500 tons. The details of that are on page 51.* On page 35, he gives a hypothetical profit and loss account for one year on this scheme, which shows a profit of Rs. 3,87,000 after meeting all interest and working charges, but excluding incidental savings shown on page 36 due to better handling. Major Gordon assures me that he has been conservative in estimating and that his figures have not been influenced by trying to make out a good case; for instance, he has estimated for only three turn-overs and for a storage of only six months in the year.

The direction in which the railway would be most directly concerned in the event of the introduction of elevators would be in connection with the adaptation of wagons for bulk carriage of grain and seeds. The alternatives are to have a certain proportion of goods stock solely for bulk traffic or to make the majority of our wagons to take both bulk traffic and all other kinds of merchandise. Major Gordon has some drawings of these which he can show you later.

In conclusion, I do not mean to suggest that the present investigation is sufficient to embark on this large scheme forthwith, but I urge that it is sufficient to show that there is ground for proceeding with a more detailed enquiry, the preparation of detailed estimates, the drafting of rules, and, if necessary, legislation, &c.

For the detailed enquiry, from my own experience, I would suggest that it should be placed in the hands of two whole-time men: one an engineer of suitable experience, the other a man experienced in civil administration, Revenue work and marketing of crops, and I think it is important that both these men should be unconnected with any particular firm either of contractors or of merchants. If such an enquiry were started now, the results would probably be available by the time the Royal Commission drafts its report.

44,885. *The Chairman*: Do you suggest that the Royal Commission should institute this enquiry and place the charge upon their budget?—I do not quite know what the best procedure would be, but I take it there might be a recommendation from the Royal Commission to the Punjab Government or the Imperial Government to go into further detail in this matter.

44,886. It is in your mind that Government should pay for the enquiry?—Yes.

44,887. Is there anything you would like to say at this stage, Major Gordon?—(*Major Gordon*): Only that I agree with Colonel Walton that the port elevator should not precede the country elevators, but I think it should be ready at the same time as the up-country elevators.

44,888. In that you to some extent disagree with Col. Walton?—We had not discussed the matter.

44,889. Col. Walton, you hardly thought it necessary that the port terminal should be constructed at the same time?—(*Colonel Walton*): I think this scheme would have to be brought in by stages; I think the first stage would

*Report on grain elevators, supplement to the Memorandum on the North Western Railway Sphere, 1926 (not printed).

be up-country elevators and the port elevator would follow soon afterwards; but I think the up-country elevators could probably be worked without a port elevator for a time.

44,890. In making your scheme are you concerned with the export trade or with the trade for internal consumption in India?—(*Major Gordon*): With both.

44,891. And a complete system would, I suppose, entail terminal elevators at the port and also at the principal centres of consumption?—Yes.

44,892. You suggested, Col. Walton, that a beginning might be made with up-country elevators alone?—Yes.

44,893. Do you know the history of the one existing elevator?—I have heard a good deal about it, but I do not think one should judge an elevator system merely from one elevator and that, too, one which I understand is not suitably designed.

44,894. You say one should not judge an elevator system from one elevator, but surely, if you are going to start off with terminal elevators alone, you are really embarking on a series of independent elevators?—To a certain extent there can be transfer between up-country elevators.

44,895. I think your idea was to begin with the up-country elevator?—There can be transfer between up-country elevators, and any consignment to places where there was no elevator in the first instance would be by issuing in bags.

44,896. You rightly point out that, if you have the up-country elevator only and no terminal elevator, you would presumably have to bag. Does that leave the services of storage and cleaning and grading as the only services which the up-country elevator could perform?—It would result in better handling and also be a saving to the cultivator, for he would go direct to the elevator organization and would avoid probably some middlemen's profits.

44,897. What is the smallest unit, Major Gordon, that you contemplate receiving?—About one ton.

44,898. So that you would give a certificate for one ton or over and thus cut out a very important proportion of small men?—Yes, the small men would be reached through their co-operative societies.

44,899. It has been suggested in evidence before the Commission that the cultivator would be disinclined to see the identity of his wheat obscured and, in order to accustom him gradually to the idea of taking a certificate for his wheat, it might be necessary to preserve the identity of that wheat by placing it in a separate bin. You do not contemplate that, do you?—No, I think it would be impossible from the financial point of view.

44,900. I see, in framing your budget, you reckon to store for six months. How do you arrive at that estimate?—Six months represents the average storage of any portion of the wheat throughout the year.

44,901. That six months would be the storage over all your accommodation?—Yes, at three turnovers this represents two months storage per unit handled. At five turnovers 1⅕th months storage per unit handled.

44,902. Is that not a very optimistic figure?—The wheat has to be stored somewhere; much of it is stored at present for the whole year and some of it is carried over and held up for better prices during the next year.

44,903. But if you are dealing with the export trade your six months goes by the board at once, does it not?—Yes, but the export period extends over at least three o four months so that the storage of export wheat should also average about two months and the more the turnovers the better the financial results.

44,904. With regard to the export trade, what storage time would you expect over all?—I think that would depend on the amount of export.

44,905. No doubt it is a difficult thing to get at, but it is nevertheless a very important factor?—I have framed a separate budget for the Port Elevator at Karachi in section VIII of my Report.

44,906. What storage time are you allowing for there? Is it one month over the whole of the storage capacity?—No, one month per maund handled.

44,907. So that, as regards internal trade, you adhere to this figure of six months. You do not think that is a conservative figure?—No, I do not think that six months is a specially conservative figure; I think it is a reasonable figure, but of course it may be more or less than six months. It is very difficult to say definitely; I have taken six months in my estimates as being the probable figure for storage of one-third to one-fifth of the surplus crop.

44,908. Have you founded yourself, in making this particular estimate, on the experience of other countries?—Yes.

44,909. Which country in particular?—South Africa, where the conditions are very similar to those obtaining here; they have cheap labour available, although skilled labour is very expensive.

44,910. How much experience has South Africa had?—Very short experience, but from the report of the General Manager which was received the other day, I find that even with the short experience that they have had their expectations have been more than realized.

44,911. Do you agree with Col. Walton that before any further opinion could be given a very much more detailed and searching enquiry is necessary?—Yes.

44,912. As to the value of grading for the export trade and for the trade for internal consumption respectively: into how many grades do you suggest that Indian wheat could usefully be divided for the export trade?—I am by no means an expert in the wheat trade and cannot pronounce any views on that. Mr. Roberts has had considerable experience in that direction. Some millers in England favour four grades for Indian wheat.

44,913. Still it is the case, is it not, that the larger the number of grades into which you have to split your wheat the more expensive the operation becomes?—That is so, but in the areas to be served by each individual elevator there is a tendency to confine the types of wheat grown in a certain area to those most suitable to that area, and the elevator would encourage this practice so that each individual elevator need not be subdivided to handle all the different grades.

44,914. In a note* which Mr. J. H. Gillete of Manchester has prepared for the Commission, it is stated that the differences between the different classes of wheats are great enough to rule out the possibility of having one standard Punjab wheat, with grades according to cleanliness and so on. The miller who wants Lyallpur wheat will not be satisfied with wheat from Amritsar, though at present there is a considerable quantity of wheat railed to Lyallpur for sale there as Lyallpur wheat; so that Mr. J. H. Gillete contemplates having a series of grades for each of the typical wheats?—Yes, of wheats grown in different districts.

44,915. How about the value of grading for the internal trade?—Mr. Gillete's note appears to refer to internal trade. The buyer at home does not specify for Lyallpur or Amritsar wheat; he buys so-called Karachi wheat.

44,916. It has been suggested to us by another witness interested in the flour manufacturing industry in India that from eight to nine grades might be required?—Yes, I myself have thought that it might be possible to work to eight grades so far as I have been able to gather from the information which I have obtained.

* Not printed.

44,917. The fact remains, therefore, that there is a wide difference of opinion on these very important matters?—Yes.

44,918. Do you yourself find that there is very little firm conviction as to these very essential factors?—Yes; in fact I should say that there is very little knowledge of these matters in the country.

44,919. Is there any enthusiasm for the erection of elevators evinced in the trade itself?—No.

44,920. If an elevator system were to be constructed on a particular line, Colonel Walton, do you think the Railway would consider the advisability of declining to carry wheat in bags on that particular section?—I do not think that the Railway could decline to carry it in bags.

44,921. What is the attitude of the Karachi Port Trust in this matter?—(*Major Gordon*): They are very shy of incurring capital expenditure. They made a special investigation of their own by sending their Chief Engineer Mr. Neilson to the United States and Canada and he came back very much impressed with the system obtaining there, but he did not think that Karachi should embark on an elevator unless there were up-country elevators. (*Colonel Walton*): I think that the Karachi Port Trust have stated that they are prepared to erect an elevator in due course when it is shown to be necessary. (*Major Gordon*): Yes, that is so.

44,922. Broadly speaking, it looks from the list of replies to the Questionnaire which is printed on page 65 of the report on elevators, as though those who might possibly benefit from the erection of elevators and would run no risk by their construction are in favour of the experiment, while those who would be expected to put down a certain amount of the first charge are somewhat shy?—Not quite; most of the members of the Punjab Government who have sent in replies were generally in favour of the system; so also was the Collector of Karachi.

44,923. In the case of your internal trade system designed for handling wheat for internal consumption, your terminal elevators would be outside the Punjab to a great extent?—Yes, a number of them would be; there are also large consuming centres in the Punjab itself.

44,924. Who, do you suggest, should own the terminal elevators outside the Punjab?—I think the Railways, if they were State-owned; it would only be a warehouse very much like what Railways have at present in England for all commodities.

44,925. In making your calculations, Major Gordon, have you budgeted for any change in the average surplus available for export from India?—On page 53, I show the number of turnovers which would be necessary in order to make the port elevator financially justifiable. On page 57, you will find that a 40,000 ton elevator would require ten turnovers, that is to say the export of any commodities which can be handled by the elevator would represent a total of 400,000 tons, which is not a very high figure; the 80,000 ton elevator would only require to have seven turnovers which would amount to 560,000 tons, and that is well within the amount which is handled to-day. I have also budgeted for a sinking fund to wipe out the capital cost of the Port Elevator in 35 years in case exports of grain and seeds should cease after that period.

44,926. What do you expect will be the future of the export trade in Karachi? Do you expect to see it rise?—(*Major Gordon*): I was on special duty in Karachi for six months to investigate that question, and it seemed to me the trade would not rise as rapidly as was expected by some of the merchants and the Port Trust in Karachi, and that Sind would be a very keen competitior of the Punjab. They expect to grow a million tons of surplus grain from the Sukkur Barrage Irrigation system in Sind,

and that will compete with the grain trade of the Punjab, and will have a lead of only 150 miles as compared with 800 miles in the case of the Punjab wheat. Unless the Punjab takes care to encourage and cheapen its trade in these commodities, it will be cut out by Sind so far as the export trade is concerned.

44,927. From past experience, do you expect the surplus available for export to increase step by step either with the increase in the area irrigated or with the increase in the area actually under wheat?—No, without elevators I think it will not increase to that extent.

44,928. Is not there a tendency for the population in India itself to consume more and more wheat?—Yes.

44,929. The increase in canal areas will mean an increase in population, and in a population which is already wheat-eating to a very great extent?—Yes, and is tending to become more so, making it even more important to take steps to ensure that the wheat shall be obtainable; without grain elevators and the export trade a surplus of wheat is not likely to be grown

44,930. You think the export trade is a stimulus which induces the farmer to sow wheat?—Yes.

44,931. Had you made a study of the elevator problem before you took up this special inquiry?—No, I had no special knowledge of the subject.

44,932. On the gauge question, would you like to say anything more than is in your note, Colonel Walton?—(*Colonel Walton.*) So far as extensions are concerned, we find that the second-hand rails, which are freed by the relaying of main lines with heavier rails, enable us to bring the cost of new broad gauge extensions, lightly laid, down to something like Rs.55,000 a mile, which compares very favourably with the cost of narrow gauge, for which the rails cannot be obtained so easily and for which you have to have a much larger reserve of rolling stock. For the present, therefore, we are able to lay light broad gauge lines in the plains which we can gradually bring up to a better standard as the traffic justifies it. We are only using the narrow gauge (which in this part of the world is 2 feet 6 inches) for the hill sections, e.g. the Kangra Valley Railway, 104 miles, and the extension in the Zhob Valley in Baluchistan.

44,933. What is the view of the railway administration on the question of the development of motor transport as a feeder to the railways?—As a feeder we welcome it whole-heartedly.

44,934. Are you considering the possibility of the railways themselves developing feeder traffic by road?—We are not in favour of developing our own motor transport.

44,935. Do you see any indications of road transport being developed on an important scale?—There is a good deal of competition in certain parts of the Punjab where metalled roads run parallel to railways, and where that is so, motor omnibuses and cars often compete with us, because they can run to their own timings and take people from door to door. To meet that we are trying to improve our service of trains by having shorter and more frequent trains, and for that purpose we have got out a number of light units such as Sentinel coaches.

44,936. So that the general public is deriving a certain amount of benefit from this competition?—Yes.

44,937. I suppose you have to pay for the upkeep of your track, whereas the road traffic gets its track paid for by the taxpayers?—Yes. The motor competition we have to meet at present is not very serious, because the number of cars and the length of metalled road is not very great; but I should like to see the metalling of roads parallel to railways, either existing or proposed, postponed until a later stage of the development of the Province.

and the money used for radial roads leading to the stations. I think that would be for the good of the Province. I do not want to take too narrow a view, but in this Province there seems to be only a limited amount of money available to build metalled roads. I understand the programme is limited to 100 miles a year, whereas railway projects, being revenue-earning schemes which either pay for themselves or can be justified with a small guarantee from the Provincial Government, can be developed at a greater rate, and we are going in for a programme of 300 miles a year. It seems to me it is not good policy for the Provincial Government to compete in its road programme with the railway programme, because if it does it may cut out a number of railway projects which would otherwise be feasible.

44,938. *Mr. Calvert*: In these days of motor cars, do you think the Government could resist the demand for these big trunk roads?—A certain number of trunk roads must be made for political and other purposes, but generally speaking at this stage of the development of the Province, where the roads are very few, it seems to me the money would be better used in giving access to stations than in building roads parallel to railways, which seems to be the tendency at the present time.

44939. *The Chairman*: Looking at the elevator problem from a railway point of view, I see you have not much hope that elevators would spread the grain-carrying trade over the year to any important extent?—(*Colonel Walton.*) I think it will have that effect to a certain extent, but we carried a bumper export traffic in 1924, when the peak at Karachi rose to 12,000 tons a day, without difficulty. There is no reason why we should not carry any export traffic that is likely to offer, but I do think a port elevator would tend to spread it over a larger number of weeks.

44,940. I think I did you an injustice just now. It was the Railway Board that expressed that view, and not your administration. I must correct that?—I do not want to give any evidence contrary to the Railway Board, but, as I said, that was my personal opinion.

44,941. I take it that from a railway angle what you are concerned to get, if you can, is a thorough inquiry into this question of grain elevators at someone else's expense?—No, what we want to see is some decision for the future as to whether there is likely to be an elevator system or not, especially at the port, because, as Major Gordon said just now, he was in Karachi for six months and prepared a report as to the improvements required there to meet the future trade. He submitted a report with which I am in agreement, but it is with the proviso that the present system of handling the trade remains unchanged. I look on this as an opportunity for having a settlement made for the next generation or so whether we are likely to have elevators at Karachi or not, because the lay-out of the Port Trust yards at Karachi and of our own yards depends on that. We work the Port Trust yards at Karachi, and we are therefore very much bound up with their lay-outs. As regards the cost of this investigation, I think it might easily be shared between the Central Government (possibly in the railway budget), the Punjab Government and the Government of Bombay for Sind. The amount it would cost would not be a heavy burden on any of those three.

44,942. As regards the internal trade, what would be the purely railway point of view? Would you expect to profit by the construction of an elevator system?—I do not see that the railway itself would benefit by it, but it would be of benefit generally in this way. At present a certain amount of grain is sent from A to B and then back again. With an elevator scheme all that movement would not take place, and the credit would go to the elevator scheme. There is, for example, quite a large movement of grain at present between various places and Amritsar, and then Amritsar sends it out again. If there was an elevator scheme, and the elevator at Amritsar was sufficiently filled to meet the local demands, by judicious arrangement a

certain amount of cross-haulage could be saved. The money so gained would not come to the coffers of the railway but of the elevator organisation. There would be a loss to the railway owing to a certain amount of loss of traffic.

44,943. *Sir Ganga Ram*: With an elevator system, the first necessity is for bulk carriage. That is one of its advantages, because the grain is carried in bulk and not in bags?—The railway is affected primarily in the matter of bulk carriage, yes.

44,944. Then why not start bulk carriage now as a first step, so that you may find out what the difficulties are? You can do that with the least possible expense. When giving evidence at Delhi, Mr. Govan said he would be only too glad to get his grain in bulk, and I think there are others in the same position. The second necessity, which is more important still, is for someone to determine what is going to be standard wheat. At present standard wheat means dirty, adulterated wheat, with 5 per cent. barley, 2 per cent. mud and so on. Is that to be called standard wheat or is pure wheat to be called standard wheat? If the present system is to remain, at what stage is pure wheat to be turned into standard wheat? At present, that is done either by the exporters or middlemen. They used to do it at Karachi; I have seen it myself. That is the second important point to be decided. The third question I want to ask is this. At the time the Lyallpur elevator was started, I believe the export trade was over a million tons, yet although production has doubled the export is now only about 300,000 tons?—(*Major Gordon*): Our figures do not show any increase in production such as that.

44,945. How much has it increased since the Lyallpur elevator was built?—There has been practically no increase.

44,946. Are you quite sure?—Yes. We have a chart for wheat.

44,947. The area under irrigation has increased?—(*Major Gordon*): It has not had a corresponding effect on the wheat crop. (*Colonel Walton*): You would expect it to have that effect, but it has not.

44,948. *Sir Ganga Ram*: I will summarise my views on the matter. First of all there is the question of bulk traffic. Bulk carriage will not be possible unless there is one grade for everything. If everyone is sowing wheat from the same seed, it might be possible; otherwise uniform quality for one wagon-load will be difficult to obtain. I suggest you should start bulk carriage at once as an experiment. The second question is standard wheat. It is very important to determine whether in future pure wheat is to be called standard wheat or whether adulterated wheat is to be called standard wheat, and, if the latter, at what point you are going to standardise it. The beauty of the elevator system should be that foreign markets would accept all wheat that comes from the elevator as being pure; otherwise there is no advantage in it?—(*Colonel Walton*): As regards the question of starting with carriage in bulk, when there is the elevator system going, the loading into wagons will be from the elevator. If we get those wagons now they would probably have arrangements for loading the wheat through the roof.

44,949. Will they empty the bags there?—The wagons have to be altered so as to prevent the wheat falling out on the rail on the way down to Karachi.

44,950. I am suggesting that you should make an experiment in bulk carriage; I fear that you will experience great difficulty in carrying bulk grain. To begin with, those who take wheat will be faced with the difficulty that no uniform quality is available?—May we leave the question of quality till afterwards. The question of carriage in bulk has been solved in other countries. I have here two pictures of South African wagons adapted for bulk carriage.

44,951. I quite understand that you can do it, but I am asking you why you do not make an experiment here where the circumstances of the people who are handling wheat are different?—The object of having an experiment of this sort would be to see whether it is technically feasible or not to carry in bulk, but we know that it is feasible in other countries.

44,952. I think you will be faced with difficulties because you will not get a uniform quality?—The object of experiment seems to be merely to see whether bulk carriage is feasible or not; we know that in other countries it has been found to be feasible by building new wagons or adapting wagons for bulk carriage; therefore it does not seem to be necessary to conduct an experiment to prove that in India. If this elevator system is to be tried out, I think it should be tried out through all the operations of a scheme sufficiently large, possibly with not the whole 78 elevators that have been mentioned in the first instance but with a proportion of them and that all the operations should be carried out. After all, a million pounds is not a very big sum with which to try an experiment, even if it involves the whole of that sum. I feel that the question of bulk carriage by rail has been solved in other countries and therefore can be solved in this country. It is only a minor item in the whole scheme. As regards the question of standard wheat, I am afraid I am rather ignorant as to grades of wheat, but I understand that for the purposes of the elevator scheme there would be 8 or 11 grades of wheat all of which would not probably be dealt with in a particular place; the number at one particular place might be considerably less than eight. I do not think there is any idea of speaking of standard wheat for the purpose of an elevator scheme where grading is adopted.

44,953. At present the word "standard" means wheat with 5 per cent. barley, 2 per cent. mud and so forth; is that definition to be preserved?—I understand that, in Karachi, now they have revised their specification for wheat and it does not include dirt. When I was in Karachi a little time ago, I was given to understand that some of the specifications were without dirt; but the main elevator will have facilities for cleaning.

44,954. In future the expression "standard wheat" would be used with reference to pure wheat?—Yes, I take it so; I hope that will be the result of adopting an elevator scheme.

44,955. Have you asked the exporters about this?—I cannot speak with authority on this subject.

44,956. Then there is the question of motor competition with railways on feeder roads if they are metalled. You will appreciate the importance of that with regard to this new railway you are constructing from Jaranwala; you will see how much profit you will get unless you influence the Government to keep that road in thoroughly bad order?—There will be three level crossings on that road.

44,957. Do you mean you have put in three level crossings in order to impede the traffic?—I do not say that.

44,958. A friend of mine in England has drawn my attention to the fact that recently an Act has been passed in Italy according to which railways will not be allowed to compete with motor traffic and that the road will always be kept in good order?—Does that mean that in Italy the railways are not allowed to run motor services on the roads in competition?

44,959. Wherever there is a motor service, a railway is not allowed to be built?—That is in Italy. The point I was trying to make is that for the good of the masses of the Province it will be a pity if parallel roads are built which make it impossible for us to justify railway schemes.

44,960. And *vice versa*?—Yes; but the railway being a revenue-earning concern it is able to justify its projects to a greater degree than roads, and the railway programme is 300 miles per annum as against 100 miles by road.

44,961. *Sir Thomas Middleton*: Is the elevator system known in any country which has not got a large export trade?—(*Major Gordon.*) No.

44,962. What happens with regard to the internal trade in countries such as the United States and Canada which have a well developed elevator system for the export of wheat? Who owns the terminal elevators?—In the United States the proportion of the export is about 25 per cent. and the number of elevators has continued to grow during the fifty or sixty years that the system has been in use. They are owned by a large number of different owners: Railways, the State, farmers, co-operative societies, merchants, millers and all sorts and conditions of people. In the U.S.A., the total elevator storage capacity is about equal to the total wheat crop.

44,963. But are the terminal elevators for the 75 per cent. of wheat which is consumed internally in the hands of millowners and consumers?—They are mostly in the hands of elevator companies public and private.

44,964. Companies have been formed for the purpose?—Yes.

44,965. In dealing with the internal trade in this country, I think you said you would accept parcels as small as one ton?—Yes.

44,966. What kinds of bins would you provide as being the smallest practicable for the country elevators?—The bin should be as large as possible, somewhere in the neighbourhood of 250 tons. If they are built circular, there will be interspaced bins which are very much smaller and they would be useful possibly for handling seed, out of condition wheat consignments under dispute and similar purposes.

44,967. Will not the size of the bin have to be regulated largely with reference to the different varieties of wheat that you might have in a particular district?—Yes.

44,968. For instance at Lyallpur, if you have one uniform quality, you can go in for large bins?—Yes.

44,969. While in another area you may have three or four bins?—Yes. You would not necessarily have smaller bins; the capacity of the elevator is about one-fifth or one-fourth of the produce which is likely to be brought to it in a year.

44,970. The country bin is refilled five times?—That is what the South Africans estimated but their exports are of course rather more in proportion than those of the Punjab; I think it is about 50 per cent. at present. I have estimated for three fillings.

44,971. Then it is that part of the crop which would be stored between August and November that would be specially benefited by the storage capacity?—Any grain which was stored during the rains and after. Any wheat which remains in the elevator after the rains start will be saved the usual deterioration which takes place.

44,972. But the total capacity of the elevator for storage would be as you have indicated one-fifth?—Yes; I was only looking for a three times turnover and therefore one-third of the wheat.

44,973. I am thinking of the effect of the elevator on the safe storage of wheat?—Yes, that is the country elevator. The country elevator will empty into the terminal elevators and the movement can go on during the rains by rail. The quantity of wheat which would be safe-guarded would therefore be rather in excess of the total capacity of the whole elevator system—country and terminal.

44,974. I think you said you found the export trade not very enthusiastic on this particular question?—No, they are not at all enthusiastic.

44,975. Did you form any conclusions as to the cause of the lack of enthusiasm?—It appeared that the simplification of the grain trade was perhaps at the bottom of it.

44,976. They fear that there may be less work for the middle man?—No there will be more work for the middle man and we hope to encourage a larger export trade; but they feared increased competition. It is not necessary to be an expert to take a view of the market when there are grain elevators; anybody can do so.

44,977. Do not the trade recognise that if, as you say, the elevator system would develop export, they would share in the additional profit which will come from the additional export?—The present exporters have worked up an excellent reputation in the country and abroad, they have their agents scattered about the country and they have a virtual monopoly of the trade at present; they do not want to lose that. Also they have had no experience of the elevator system.

44,978. You referred incidentally to the expectation that there may be a million tons of extra grain in Sind?—Not extra, but actually surplus to the requirements of Sind. That is the estimate of the Sukkur Barrage, but I think they have under estimated local consumption; that is my personal view. However, they claim to have based their estimate on very conservative yields.

44,979. You argue that the larger the export trade the better for the country because it will provide a larger acreage and bigger margin of insurance against a short crop?—Yes.

44,980. *Professor Gangulee*: Do you think this elevator system would shorten the chain of middle men?—Yes.

44,981. Would it help to stabilise the market prices?—Yes.

44,982. In constructing the country elevator, do you think it would be necessary to have drying arrangements?—No, I do not think it would be necessary to have them at all the country elevators.

44,983. Would it be necessary at the port?—Yes it would be advisable in the terminal elevators, on a small scale in the port elevator and also in a certain number of the country elevators at convenient centres, specially at the market centres.

44,984. *Mr. Calvert*: Could you give use some indication of the kind of difficulties which exist in the Punjab and which do not exist in South Africa?—I think, in South Africa, you are dealing with a more educated producer and one who is farming on a larger scale.

44,985. You have smaller parcels here?—Yes.

44,986. Is the climate a further obstacle here?—No, I should not think so.

44,987. In fact South Africa has several grains, it has maize as well as wheat?—Yes it has chiefly maize and millet; the maize is, I believe, a more sensitive cereal to weevil than wheat; they have found by experience that the savings from weevilling constitute one of the chief advantages of the elevator; that is their experience.

44,988. Would this adaptation of wagons for bulk transport interfere with the new pooling arrangements; those wagons would have to be confined to a particular section of line, would they not?—(*Colonel Walton.*) The system of having wagons in a general pool has been going on for some years; there is the question whether these wagons should be specialised for this traffic or whether they should be useable for general merchandise; I am very much inclined to think that we should have our wagons useable for ordinary

merchandise as well because otherwise, if you have wagons specially for this traffic they have got to run back again light. Also a very large amount of our traffic is in miscellaneous smalls and not in large wagon loads.

44,989. But if you had adapted a certain number of wagons for this bulk traffic, you would want to confine those wagons to use on that line on which the bulk was being run?—You would have to keep them on that line, yes, otherwise you would not have enough to meet the demand.

44,990. With regard to trunk metalled roads, motor car traffic only competes in the higher classes in the first and second classes?—Not altogether, no.

44,991. It does not compete with you in third class traffic does it?—To a certain extent it does.

44,992. The competition is chiefly with regard to higher classes?—In certain parts, there is a lot of what would be third class passenger traffic going by road.

44,993. Would not there be a certain financial gain to you, if you could lose your first class traffic?—I do not think so.

44,994. I thought your first class traffic was a source of loss to you?—We cannot run trains without first class accommodation and we would rather have that accommodation full than running empty.

44,995. *Mr. Kamat*: I want you to explain to us the system of grading which could be introduced with elevators. In paragraph 4, page 13, of this report* you say that, in the elevator system, the grading is entrusted to the manager of the elevator who will determine the grading according to the type, the size, the colour, the hardness, the moisture, the weevil and the dirt in the wheat. I take it there will be certain standards in the grading?—(*Major Gordon*): Yes.

44,996. And there will be so many different factors on which the grading will be determined; do you not think it is rather uncertain to leave the whole thing to the discretion of a manager to determine the grading for a customer?—The big wheat merchants at present leave it to their agents up country and our grain elevator managers would be at least as trustworthy and capable of discrimination as these.

44,997. Will they inspire confidence in this system in the small producer? The small producer does not care to go to the higher authorities, he does not know the procedure?—(*Major Gordon*): The procedure will be explained to him.

44,998. I suppose the decision of the appealing authority must be final?—Certainly.

44,999. And, later on, you say there will be a certain travelling inspecting staff to go about and they will test the samples. If such a system is to be introduced, then how do you say that the small producer will easily get an appellate decision, so to say?—A sample of each consignment is kept in the elevator itself for a certain period of time. When the Inspector comes round he looks at these samples which are in sealed bottles bearing the grade awarded to them and he examines the sample and sees whether the grader is working on a fair basis. The sample is actually there.

45,000. Between the date of the dispute and the date of the arrival of the travelling Inspector, what would be the interval?—In case of dispute, another sample of the consignment under dispute is sent to the head office and the decision is sent back within a day.

45,001. We know the expeditious ways of some Railways?—The decision could go by post or telegram.

45,002. In spite of these complications, you think you will be able to win the confidence of the small producer?—I think so. At present, the

* Report on Grain Elevators, supplement to the memorandum on the North Western Railway Sphere, 1926—not printed.

man who sells his wheat is 800 miles away from the place where the wheat is actually analyzed.

45,003. But his agent is present there?—(*Major Gordon*): The small cultivator has no agent, and even if he did have an agent, suppose the latter said that he did not agree with the analysis, what would be his alternative? He could not rail the wheat back 800 miles and pay railway freight both ways.

45,004. He could sell the wheat to anybody who wanted to pay a higher price?—(*Major Gordon*): No one will pay a higher price; there is a ring down there among these merchants.

45,005. Is not this system open to corruption in the case of the big exporter. If a man wanted to export a large quantity of wheat he could easily give the travelling agent a handsome reward in order to get a certificate for a higher grade?—Would the man to whom he is selling the wheat be prepared to accept the wheat if it is not up to sample?

45,006. That may be another dispute, but for the time being he would get a good certificate?—The big exporter will buy his wheat from the elevator system after it has been graded and it will be placed in the steamer by the elevator system, together with other consignments. I do not see how he can benefit as suggested by you.

45,007. *Mr. Roberts*: With regard to the statement on page* 5 that there has been no increase in the wheat area following on the development of irrigation, would you not care to qualify that statement?—(*Major Gordon*): I have here figures produced by one of the firms in Karachi showing the yield in the Punjab. In 1906 there were four million tons; in 1911 four and two-third million tons; in 1920 it was very nearly 4½ million and in 1922 it was 4¾ million; but there has been no increase which will compare with the increase in irrigated areas.

45,008. What is the explanation for that?—The present system does not stimulate the export trade and therefore a surplus of cereals is not grown.

45,009. In connection with stimulating the export trade would it be feasible to discriminate between rates for the Punjab and Sind and for the internal trade?—My personal view is that it would probably be necessary to discriminate in favour of the Punjab. We already have a distinct telescopic rate for grain which gives the long distance traffic a decided preference.

(The witnesses withdrew.)

LALA GULSHAN RAI., M.A., Professor, Sanatan Dharma College, Lahore.

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION. My answer to this question is based on my Punjab experience.

(1) In the Punjab, there are very few schools where instruction in agriculture is given. There is a dearth both of teachers and of institutions for imparting agricultural education to the people. A class for the training of teachers for agricultural education does exist at the Lyallpur Agricultural College, but it is hardly enough to satisfy the needs.

(2) There is ample scope for the development of scientific agriculture in the Punjab, but there are no men to take up scientific agriculture. To remedy this there is very great and urgent need for the rapid extension of teaching facilities in the Province.

(3) The agricultural classes in the Punjab have not sufficiently advanced in education. They are, therefore, not in a position to take up the work

* Of the Memorandum on the North Western Railway sphere—not printed.

of teachers of scientific agriculture. The teachers may therefore be drawn from the present educated classes and it would not be desirable to restrict the field of choice from which teachers are to be drawn.

(4) The attendances at existing agricultural schools are not as numerous as one would wish, and there are reasons for this state of affairs. In the first place, classes for agricultural education are started in rural areas, where the value of scientific agriculture is not yet appreciated. Secondly, the nature of the agricultural education imparted at present in rural schools is not such as to impress the rural population. Thirdly, those who attend these institutions are drawn from among those who wish to enter Government service and that class is not a very large one. The institutions are not likely to succeed unless properly managed and successfully working demonstrations and experimentation farms are also attached to every institution imparting agricultural education and such farms are thrown open to the visits of the neighbouring cultivators.

(5) The only incentive which, at present, induces the lads to study agriculture is Government service.

(6) The institutions at present are open for admission mainly to the agricultural classes. If restrictions against the admission of present-day educated classes were removed then, I believe, people belonging to other than agricultural classes would also seek admissions to these institutions in much larger numbers.

(7) The present courses of study seem to pay more attention to theory than to practice. The courses should be modified so as to make them more practical.

(8) I would not eliminate nature study, but it seems that at present too long a time is spent on nature study. The school plots and school farms are also very small in size. We require rather bigger plots.

(9) The majority of students who have studied agriculture have taken to Government service.

(10) The agricultural profession cannot freely be taken up by the middle class population in the Punjab. The Punjab Alienation of Lands Act prohibits people belonging to tribes not notified under the Act from purchasing agricultural land in the Punjab. The members of tribes not notified under the Act are not usually admitted to institutions imparting agricultural education. Unless their disabilities are removed, middle class people in this Province cannot freely adopt agriculture as a profession.

QUESTION No. 5.—FINANCE.—The vast majority of cultivators in this Province are very poor and the plots of land they cultivate are very small. The cultivators have not got the means for properly financing agricultural operations. In my opinion, the proper financing of agriculture should be undertaken in two ways. In the first place the operations of the co-operative societies should be extended to much wider fields, and greater facilities should be provided for long-term credits which are required for making permanent improvements in agricultural lands.

The present *taccavi* advances are made purely through Government agencies. Cultivators would be induced to make much fuller uses of these advances if *taccavi* grants were made through the agencies of the village *panchayats* wherever they exist, co-operative credit societies or district boards, or through *sowcars* and bankers of recognised position.

In the Punjab, it is not open to the capitalist classes to invest money freely in agriculture. The profession of agriculture in this Province is confined only to persons belonging to tribes notified under the Punjab Alienation of Lands Act. But these notified tribes do not usually have among them a large capitalist class. For lack of capital the agricultural classes cannot

undertake improvements involving the investment of much capital. Agriculture as a whole, therefore, suffers. Unless the present-day restrictions against acquisition of agricultural land by capitalist classes are removed, no proper financing of agricultural operations in the Punjab is possible.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) The main causes in my opinion of borrowing by cultivators are:—

1. On account of the uneconomic size of the agricultural holdings, enough is not raised on the land for the subsistence of the family dependent on it. The cultivator is, therefore, driven to borrowing to make good the deficiency in the income from his land.
2. The system of land revenue assessment is so inelastic that, while in good years a cultivator is tempted to spend all his earnings that he can save, in lean years he is forced to borrow even in order to pay the land revenue.
3. The agricultural operations do not produce enough for him to do, and he has nothing to employ him during slack seasons. This enforced unemployment compels him to borrow.
4. The drink evil and extravagance at social and religious customs and ceremonials are also to some extent responsible for the indebtedness of cultivators.

(ii) A cultivator usually borrows from:—

(1) His landlord, (2) the village moneylender, (3) the local co-operative society and (4) from Government in the shape of *taccavi* advances.

(iii) The reasons that compel him to borrow money also prevent him from repaying it.

(*b*) So far as legislative measures for lightening the burdens of debt are concerned, they have all been employed already. We already have, on the Statute Book, measures for restricting the sale or mortgage of land. We have already got a Usurious Loans Act. What we do really require for lightening the burden of debt for the agriculturist is the provision of some subsidiary occupations by which they could supplement their incomes from land.

(*c*) We have had already in the Punjab, a measure which effectively restricts and controls the credit of cultivators and limits their right of mortgage and sale. I refer, of course, to the Punjab Alienation of Lands Act of 1900. Under this Act there are some fifty small and big tribes that have been notified under the Act as "Agricultural Tribes." Under this Act each district has a separate group of tribes for it. A member of a notified tribe is prohibited by law from selling any portion of his land to any one not belonging to the group of tribes notified as agricultural tribes for his district. He possesses unrestricted right of sale only so far as his transactions are confined to persons within the group of tribes notified as agricultural tribes for his own district. He can mortgage his land outside the group only for a period not exceeding twenty years, at the expiry of which the debt, even if not repaid, is automatically extinguished. In notifying the tribes, it is not only actual cultivating classes that are notified. Political considerations very often enter into the decisions regarding the notification of tribes as agricultural tribes. An examination of the list of notified agricultural tribes will show that in this list there are included several castes whose traditional and actual occupation is not agricultural, and on the other hand several castes and tribes are excluded from this list although their actual occupation is agriculture. While notifying tribes under the Punjab Alienation of Lands Act, it seems it is reallly political considerations that weigh and not purely agricultural interests. The published object of the Act was to prevent expropriation of peasant proprietors from their lands and to reduce indebtedness. The Act has failed to achieve

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either of these objects. It has not reduced indebtedness; on the contrary, agricultural indebtedness has, during the last 25 years, assumed far more serious aspects. Again, I have strong reasons to believe that the Act has not prevented expropriation of peasant proprietors. It is no doubt true that during the last 25 years more land has come into the possession of "Notified Agricultural Tribes," taken as a whole. Land has certainly passed out of the hands of non-notified tribes. But within the circle of notified tribes, the poorer and smaller landholders have gone on losing land. The bigger fishes have been swallowing up the smaller fishes. Some of the less enterprising castes and tribes within the group of notified tribes have lost and they have hardly received any protection from the Punjab Alienation of Lands Act. The Act was passed with the intention of protecting the peasant proprietors against money lenders. It has brought into evidence a class of money-lenders among the notified tribes themselves.

It has, without diminishing indebtedness and without preventing the expropriation of peasant proprietors, created a new caste and a new hereditary class which dominates the Punjab politics. This new caste, a creation of British rule, has failed to improve agricultural methods; it does not undertake scientific agriculture and yet it would prevent other classes, more advanced and more intelligent, from taking up the profession of scientific agriculture. The Punjab Alienation of Lands Act tends to make the agricultural profession in this Province an hereditary profession. The British people, who usually decry and condemn the Indian institution of caste, have themselves established one by means of the Punjab Alienation of Land Act. For the reasons stated above, I am strongly of opinion that it would neither be wise nor expedient, nor in the interest of agricultural development, to undertake measures to restrict or control the credit of cultivators.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) On account of the excessive sub-division of holdings, they have ceased to provide a living to the holders. In order to make these holdings produce enough, it would be necessary to (1), employ scientific methods in agriculture and, (2), utilise these small holdings not for raising ordinary crops, but for fruit culture and for raising garden produce.

(*b*) Natural conservatism and sentiments of attachment to one's own ancestral lands stand in the way of consolidation of small holdings. Consolidation, however, can succeed by co-operative methods. I believe any legislative measure for this purpose will produce strong opposition.

(*c*) To prevent future sub-division of holdings, I would propose legislation. For each assessment area in the district an economic size of holding should be determined. This minimum area of land should be held inalienable for all persons, to whatever caste or tribe they may belong. There should be no restriction on the sale or alienation of area which is in excess of this minimum area.

QUESTION 8.—IRRIGATION.—(*a*) (i) Irrigation works are urgently needed in the following districts of the Punjab:—

1. Gurgaon.
2. Hissar.
3. Pind Dadan Khan *tehsil* of Jhelum
4. Khushab *tehsil* of Shahpur.
5. Mianwali.
6. Jhang, west of the Chenab River.
7. Muzaffargarh.

In Gurgaon district, irrigation works in the form of storage tanks are needed. In other districts, perennial canals are necessary. Schemes are ready for the irrigation of districts mentioned in 3, 4, 5, 6 and 7, but so far the Bombay Government has stood in the way.

QUESTION 23.—GENERAL EDUCATION.—(a) (i) The Punjab University controls education in the Lyallpur Agricultural College and the University holds a B.Sc. examination in agriculture. In the ordinary high schools, agriculture is an optional subject which it is open for a candidate for the matriculation examination to offer. But the course in agriculture for the matriculation examination is of a standard of hardly any practical utility. I would like to raise the standard of the course for matriculation in agriculture and make it more practical.

(ii) In the middle school also, I would raise the standard of the course in agriculture. In vernacular middle schools, agriculture should, like mathematics or languages, be a compulsory subject.

(iii) In rural primary schools also, the study of agriculture should be compulsory. I would suggest the formulation of a graded scheme for instruction in agriculture from the village primary schools leading right up to the Uuniversity course. The Lyallpur Agricultural College is at present quite dissociated from the general scheme of instruction imparted in schools. Instead of standing apart, the college should become the crown of the agricultural education given in schools.

(b) (i) I would not open separate schools for imparting agricultural education. If agriculture is made one of the subjects of study in the ordinary present day school and college curriculum, then in that case the ability and culture of the rural people might be improved and, at the same time, their interest in the land be retained.

(ii) In this Province, compulsory education in the rural areas is still in its initial stages. No definite opinion about the results of this education can as yet be offered.

(iii) The people who at present seek education in our schools are those who seek Government service or wish to join the liberal professions. The others are too poor to obtain education and they do not wish to leave their hereditary professions. They consequently seldom pass beyond the primary stage.

Oral Evidence.

45,010. *The Chairman*: Lala Gulshan Rai, you have provided a note of the evidence which you desire to give before the Commission. Do you wish to make any additional statement at this stage, or may we ask you a few questions?—I have nothing particular to say.

45,011. I think my colleagues in the main would be interested in your views on the effect in this Province of the Punjab Alienation of Lands Act of 1900. You make your views quite plain in your note and I have no questions to ask you.

45,012. *Professor Gangulee*: I have just one question to ask. You are a Professor of what subject?—History.

45,013. Have you been to the Lyallpur College?—Yes.

45,014. Do you know it intimately?—Yes, I have been there several times.

45,015. *Mr. Calvert*: I realize, of course, that everyone is entitled to his own opinions on these matters, but was not there, in the Punjab, a customary law of preemption which served to prevent the free transfer of land?—Yes, to some extent.

45,016. In other Provinces, is there not a joint Hindu family system which also prevents the free sale of land?—I am not aware whether under a joint family system you can prevent the free alienation of land to the extent to which the Punjab Alienation of Lands Act does.

45,017. Under the joint family system, ancestral land cannot be sold?—There are certain restrictions, but not of the nature as put down in this Act.

45,018. Is not the joint Hindu family system more rigorous than the Alienation of Lands Act?—Under the Hindu law, if a man sells ancestral land from necessity, and necessity is defined by case law, then he has full unrestricted right of alienation.

45,019. According to the customary law of the Punjab, is not a man debarred from selling his land except for necessity?—Yes.

45,020. It has nothing to do with the Alienation of Lands Act?—No.

45,021. Quite apart from the Alienation of Lands Act, there are severe restrictions on the transfer of land?—My point is that the restrictions laid in the Alienation of Lands Act are far more severe than under the ordinary customary law.

45,022. You do not agree that, because the Judiciary have failed to uphold the customary law, the fact of such failure has led to the passing of the Alienation of Lands Act?—No.

45,023. Would you agree that the reason why Madras has not got the Alienation of Lands Act is because there the Hindu joint family system is strong?—I am not aware of the conditions obtaining in Madras.

45,024. Are you aware of the long preliminary inquiry which was undertaken throughout the whole of India before this Act was introduced?—Yes; I have read the report of those inquiries that were held.

45,025. And the reason why they did not have a similar Act in South India was because the joint family system served the purpose?—No; for the passage of the Punjab Land Alienation Act there were some political considerations which did not exist in the case of the other Provinces. In fact, Sir Charles Rivaz, when introducing the Bill in the Imperial Legislative Council, admitted that the reason why they were going to undertake legislation in this direction for the Punjab was that the political necessities in this Province demanded it.

45,026. *Professor Gangulee*: What political considerations were they?—They wanted to prevent the expropriation from land of those castes and tribes which are usually recruited for the Army; they did not want the expropriation of the yeomanry, so that for this reason they wanted to introduce this legislation; these reasons did not exist in any other Province.

45,027. *Mr. Calvert*: Have you any figures for the number of people who come within the notified tribes in the Punjab?—Yes, I think there are about a crore of them.

45,028. The usual figure taken is 12,000,000. Would you accept that?—I think that is a bit exaggerated; I have made calculations about the population of notified agricultural tribes and I think they come to exactly 10½ million. But these figures, too, are a bit exaggerated, because I have taken the census population of all the castes and tribes that are notified under the Act, whereas, as a matter of fact, we know that every notified tribe is not a member of a group of notified tribes in every district. Take, for example, the Gujars, who are notified in the Central Punjab but not notified in Multan Division. I have included in my calculations the entire population of Gujars, and thus my figures as I say are also a bit exaggerated.

45,029. You are aware, of course, of the auction of Crown lands in the canal colonies?—Yes.

45,030. The Punjab Gazette for 1923 states that in the eight years 1914-15 to 1921-22 Crown lands were sold in canal colonies to the value of 271 lakhs. Do you think that is a sufficient opening for the capitalist class to purchase?—I do not think so, because it is not only the capitalist classes that go in for purchase but also very large numbers of the notified tribes who have now become extremely wealthy during the last quarter of a century.

45,031. The openings were provided by the Government?—To a very limited extent.

45,032. *Professor Gangulee*: How is it restricted?—*In this way*: say that you have 30 million acres of land at present in the Punjab under cultivation out of which about 5 million would be land auctioned in the Canal Colonies. I am merely giving you an illustration to show that you shut out the capitalist classes from 25 million acres and you only give them facilities to purchase 5 million acres, in which area you also bring in the agricultural classes to compete with them, so that they do not possess ample facilities for purchase.

45,033. *Mr. Calvert*: In the interests of agriculture, would you put any limit to the expropriation of the agriculturist classes by the capitalist classes?—No. But I have stated in my answer on fragmentation that I would propose legislation that below a certain minimum holding which would, of course, be dependent upon each assessment area or locality, I would prohibit the alienation of lands under that minimum area for all tribes.

45,034. That is reducing the actual holding. I want to know whether you would put a limit to the expropriation of the agriculturist classes?—What is the definition of agricultural classes?

45,035. I am taking the notified tribes?—I do not accept the definition put under the Alienation of Lands Act. I have stated in my statement that there are several castes which are notified and yet they are not cultivators; for example, the Syeds in the Punjab are actually cultivating to the extent of about 29 per cent. and yet they are notified as an agricultural tribe in 28 districts out of 30. On the other hand, the Brahmins, who are actual cultivators to the extent of about 53 per cent. are not so notified.

Professor Gangulee: In some districts they are.

45,036. *Mr. Calvert*: Are the Brahmins notified?—In certain dsitricts they are notified under the "B" class, not under the "A" class.

45,037. That is to say they are protected?—To some extent; they are protected in this sense, that they are limited in their right of sale, but they do not possess the privileges which are possessed by other notified tribes.

45,038. What is the effect of the Alienation Act on these communities?—It allows certain tribes to purchase land free of competition from the capitalist classes.

45,039. Was that privilege conferred by that Act? Did it not exist prior to the Act?—No.

45,040. Before the Act was passed, could they not purchase from each other?—Before the Act was passed land was purchasable by any one belonging to any tribe. Since the passage of that Act, land could not be purchased from a notified tribe. That restricts the field of purchase. It shuts out from competition those people who are not notified under the Act.

45,041. Does that Act confer on any one the right to buy land?—It is not so stated in the Act in so many words, but that is the actual result of it. In the Lahore District, for example, a Jat would have the privilege of purchasing land from all the other tribes whether notified or unnotified. On the other hand, a man who belongs to a non-notified tribe is not able to enter into competition with the agriculturist capitalist.

45,042. But the Act does not confer any privilege which did not exist prior to its being passed?—It does in this sense, that formerly a man belonging to a notified tribe had to enter into competition with the non-notified tribes.

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45,043. You say the Alienation of Land Act prohibits certain people from purchasing land in the Punjab; is that true?—Yes.

45,044. To what section are you referring?—Section 3, which lays down that no tribe which is not notified under the Act can purchase agricultural land from a member of a notified tribe.

45,045. Have you ever read that section?—Yes.

45,046. Does it prohibit the purchase of land?—It may be put the other way round. A man of a notified agricultural tribe is prohibited from selling his land to anyone belonging to a non-notified tribe.

45,047. But you say the Act prohibits people belonging to non-notified tribes from purchasing land?—You are looking at the actual wording of it and I am looking at the consequential effect of the words. I think I interpret the law rightly.

45,048. But is there any such section in the Act?—Yes. I will read it to you. It is section 3. "A person who desires to make a permanent alienation of his land shall be at liberty to make such alienation where:—

(a) The alienor is not a member of an agricultural tribe; or

* * *

(c) The alienor is a member of an agricultural tribe and the alienee a member of the same tribe or of a tribe in the same group."

45,049. The Act prohibits sale?—Yes.

45,050. It does not prohibit purchase?—It comes to the same thing. If I am not allowed to sell my land to a non-agriculturist, it comes to this, that the non-agriculturist is not allowed to purchase land from me.

45,051. Does that Act impose disabilities on the owners? It is the owners who are prohibited from selling?—Yes, and the consequence is that a man belonging to a non-notified tribe is debarred from purchasing.

45,052. There is no prohibition against purchase in the Act?—That is what it comes to.

45,053. What proportion of the total population do you take the capitalist class to be?—Whom do you include in the capitalist class?

45,053A. You say in the Punjab it is not open to the capitalist classes to invest money in agriculture?—I am not referring to the capitalist classes who belong to non-notified tribes, but now there are capitalist classes amongst the agriculturist tribes also.

45,054. What proportion do the capitalist classes referred to here bear to the total population?—Perhaps 10 per cent.

45,055. These 10 per cent. already own about 5¼ million acres. That is the official figure?—I do not know.

45,056. How much do you think they ought to own?—Do you wish to introduce communal representation here also?

45,057. You say they ought to be able to buy more. They already have 5¼ million acres?—I would like any one who can to invest capital in agriculture, and improve the occupation.

45,058. Without limit?—If he can improve agriculture, I would let him come in. I think in the interests of agriculture it is necessary for the capitalist class to come in.

44,059. For many years past there have been auctions of land every year in the colonies?—Yes.

45,060. You are probably aware that the area auctioned is the limit which the market will bear. Do you accept that?—I have my own doubts about

it. Perhaps the area to be auctioned is fixed with a view to getting particular price in the market in order artificially to raise the price of la

45,061. As much land is put on the market as the market will bear with any fall in purchase price?—That is what is stated in the Blue Books. I not know whether that is supported by facts.

45,062. Do you accept that?—No.

45,063. You say it is not open to the capitalist class to invest money agriculture. How much money a year do you think they want to invest? At present, they have no opening for any investments. There is hardly a industry in which they can invest the money. Their only investment land and they are prohibited from investing in it.

45,064. They are allowed to invest money every year in the canal colo auctions. How much money do they want to invest? The experience that this represents the maximum?—I have already stated that, in this ope market at auctions, you have not only the capitalists belonging to no agricultural tribes but you have capitalists belonging to notified tribes well and a certain share of the land is taken by them.

45,065. Do you want a new Act passed prohibiting the agriculturist clas from competing against capitalists?—No.

45,066. Why should not the agricultural classes buy land?—You have t let the capitalist classes buy land also.

45,067. Are not they buying lands at these auctions?—Only in the Govern ment crown colonies.

45,068. Is not that very good land?—Why should they not be allowed to purchase lands elsewhere?

45,069. You think the openings for investing money in the land are not sufficiently large in the present auctions?—I never mentioned the word auctions in my note. What I said was that, taking agricultural land as a whole, whether in the crown colonies or the old areas, you do not provide sufficient facilities for the capitalist classes to come in. My complaint is this. You are perhaps aware that the capitalist classes are not only restricted in the purchase of agricultural land but they are also being shut out from other occupations. You are opening the door to the agricultural classes in every profession and making discrimination in their favour a against the non-agricultural classes everywhere. That is why I say you are creating a new hereditary caste of agricultural tribes (so called) in the Punjab who dominate Punjab politics at present.

45,070. Did not these agricultural classes exist long before British rule?—These agricultural tribes under the Alienation of Lands Act are selected arbitrarily. Formerly any one was free to cultivate and own land, but that is no longer the case.

45,071. Do you think members of the capitalist class who own land also cultivate it?—They do sometimes, and sometimes the notified agricultural tribes do not.

45,072. In the majority of cases I mean?—In the majority of cases the non-notified tribes do engage in actual cultivation. Take the Chamars. They are a non-notified tribe, yet more than 90 per cent. of them are engaged in the cultivation of land.

45,073. Are they cultivating as tenants under the capitalist class?—They are very often tenants and are also agricultural labourers.

45,074. Since when have the capitalist classes been anxious to buy land?—Since the value of land has gone up very much. On account of peace and security they have been anxious to purchase it.

45,075. No one can buy unless some one sells?—That is so.

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45,076. Why do you want zamindars of this Province to sell their land?—I do not want them to sell their land, but I want any one to be able to sell or purchase if he wants to.

45,077. If you want the capitalist class to buy land, you must want the present owners to sell it?—I would not put any restrictions on the sale or purchase of land. I would make the agricultural profession a real profession and not a hereditary occupation. I would like anyone who wants to enter the profession of agriculture to be able to do so.

45,078. *Professor Gangulee*: You would not protect the smaller agriculturists?—I would, as I have proposed in my answer to the question on fragmentation. I would prohibit alienation if the holding became too small to be of any economic value.

45,079. *Mr. Calvert*: Do you know any country in the world where a man can transfer agricultural land for eight annas?—You mean registration fee and so on, when any mutation takes place. I do not know the laws of other countries.

45,080. Have you any idea of the cost of transferring land in England?—No.

45,081. In Roumania, the cost of transferring land is so heavy as to restrict very severely the transfer of it?—I do not see how that affects my argument.

45,082. In other countries there are restrictions on transfer?—So there are here.

45,083. I mean, apart from the fact?—Yes, there are restrictions under the ordinary law of pre-emption and the customary law.

45,084. Do you think, from an agricultural point of view, this system of easy transfer is good?—I would not make it very costly. I see no reason why the actual cost of transfer should be very great.

45,085. Can you suggest any practicable method of limiting the growing influence of the power of agriculturist moneylenders?—The only way in which you can check that would be to bring them into competition with non-notified capitalists.

45,086. *Mr. Kamat*: Do you object to this Act on the ground that on principle it restricts the right of a man to alienate his land, or do you object to it on the ground that the notification of tribes is arbitrary or artificial?—Mainly on the second ground. Tribes are notified arbitrarily and for political considerations, not merely in the interests of agriculture.

45,087. You object not to the first principle but to the notification and classification of the tribes?—That is my main objection.

45,088. If you accept the principle that it is not wrong to restrict alienation then the second question of procedure, I mean the classification of tribes, is a matter of detail, which may be revised. So far as the first point is concerned, do you think there is anything in the Hindu law absolutely prohibiting all the joint members of a Hindu family from selling their agricultural land if they wish to?—There are no restrictions.

45,089. And if heavy fees are imposed in foreign countries for the transfer of a piece of land simply with a view to restrict sales or transfers, do you think that it is an analogy here?—If any restriction were placed on alienation with a view to protecting the interests of agriculture as a particular occupation, I would be in favour of it. But if this method is exploited against the interests of moneylenders as such, then I am in favour of giving equal opportunities to all classes without discriminating in favour of one class or another.

45,090. You object to the classification, that is all?—Yes, exactly.

45,091. We have been told by revenue officers having experience of this Province that this Act in actual practice has saved many agriculturists' lands passing into the hands of non-agriculturists, so that, apart from theoretical considerations, the Act has worked well for the majority of agriculturists?—I do not accept that conclusion and I have strong evidence to show that within notified tribes a large number of people have lost their land.

45,092. That is a matter of opinion?—No. I could quote Administration Reports under the Alienation of Lands Act which show the gains and losses every year of particular tribes notified under the Act and I can show from those figures that there are a very large number of tribes who have actually lost lands under the operation of this Act. Some very enterprising tribes have benefited, but other tribes have lost.

45,093. I do not like to go into the details of your Province, but assuming the official statement given to us to be correct, that this Act has benefited a number of people, is it not a correct line of argument to say that the justification of this Act is to be found not in the ancient Hindu law or the restrictions of transfer in other countries, but in the broad common sense reason that it has done the greatest good to the greatest number of agriculturists?—But I question that assumption.

45,094. If those facts and figures are proved to your satisfaction to be correct, would you say that this Act for the restriction of alienation is justifiable in the interests of the majority of agriculturists?—They have proved, and I accept their statement, that the notified tribes *as a whole* have gained very much; they have gained land from the non-notified tribes; but the expropriation of land has gone on, the Alienation of Land Act has not checked it, and it is only certain tribes that have gained. All the tribes notified under the Act have not gained. Many of them have lost heavily.

45,095. *Mr. Roberts*: I notice you are in favour of agricultural education in primary and middle schools?—Yes.

45,096. Is that belief in agricultural education fairly general among the Hindu community to-day?—I think so.

45,097. *Sir Ganga Ram*: Has the agriculturist lost in regard to credit as compared with former years; the bank will not advance money on the security of his land; is not that so?—Yes, that is so.

45,098. So that I take it that the agriculturist is not any better off by reason of the Land Alienation Act, and he has lost in credit?—The notified agricultural tribes have not only lost in credit, but they have proved to be very unadvancing and conservative agriculturists; they are not in a position to adopt scientific methods of agriculture.

45,099. *Mr. Calvert*: Are the capitalist classes going in for industries?—There are no other industries at present; agriculture is the only big industry in the Punjab.

45,100. Why do not the capitalists take to industries?—The Government has passed a number of legislative measures for the protection and promotion of agriculture, but there is hardly any Act for the promotion of industries.

45,101. *Professor Gangulee*: But who has advanced agriculture in this Province?—The Government.

45,102. Is it the capitalists or the agriculturists?—If you compare the non-notified tribes with the notified tribes, you will, in the majority of cases, find that lands in the occupation of the capitalists of a non-notified tribe are much better cultivated.

45,103. *Sir Ganga Ram*: Mr. Calvert asked you why non-agriculturists cannot buy land at the auctions; I never go to the auctions because it

is my experience that the land is sold in lots of one or two squares; if I buy a lot of one or two squares and the next lot is bought by a notified agriculturist, I have no chance of expanding my estate; therefore I never care to go to the auctions. That is the reason why a capitalist can never buy a large piece of land at auction?—That is why I stated to Mr. Calvert that in open auction the non-notified tribes have not sufficient facilities for purchase.

45,104. *Sir Thomas Middleton*: I understand you to say that a member of an agricultural tribe can only mortgage his land outside the group for a period not exceeding twenty years?—Yes.

45,105. At the expiry of which period the debt, even if not repaid, is automatically extinguished?—Yes.

45,106. I do not understand what you mean by that?—That is to say, a person who belongs to a notified tribe is permitted to mortgage his land for a period not exceeding tweny years; the mortgagee can get back his money within that period of twenty years; but if within that period the money is not repaid and some part of the money remains unpaid, then the land must revert to the mortgagor and the debt is extinguished.

45,107. Does not the mortgagee take care that he gets back his money; what interest does he charge as a rule?—That depends upon the market.

45,108. *Mr. Barron*: Are you not talking about mortgages with possession?—Yes, usufructuary mortgages.

45,109. And the mortgagee has the use of that land for twenty years?—Yes.

45,110. That is the way in which he gets back his money?—Yes.

45,111. *Sir Thomas Middleton*: But what interest does he charge?—Under this Act is only a usufructuary mortgage for twenty years that is permitted.

45,112. *Mr. Barron*: You are a Professor?—Yes.

45,113. What subject do you profess?—I teach history and political philosophy.

45,114. You have admitted that, owing to the operation of the Act, the agriculturists have redeemed a large amount of land formerly mortgaged to non-agriculturists?—Yes, I have admitted that.

45,115. And they have also acquired by purchase land which was formerly going out of their hands?—Yes, they have done so.

45,116. So that the Act has been effective?—Yes, the Act has been very effective.

45,117. For the purpose for which is was intended?—The Act was intended for two purposes, first, to reduce indebtedness, and secondly, to prevent the expropriation from land of peasant proprietors; in both these objects, it has failed.

45,118. As between tribes?—Yes.

45,119. You said just now, I think, that the value of land had gone up very much owing to the security and peace and order introduced by the British Government?—Yes.

45,120. The agents who produced that peace and order are mostly the soldiers of the Army, are they not; in the last resort it is the Army on which the security and peace of the country depends, is it not?—There are soldiers belonging to the notified tribes as well as soldiers coming from England and Scotland.

45,121. I am not speaking of any particular soldiers; it is on the soldier that the peace and security of the country in the last resort depend?—Yes.

45,122. Then why do you call it a political move on the part of Government to protect the tribes from which these soldiers come; is not that a sound piece of wisdom?—My contention is that *all* the tribes notified under this Act are not soldiers; for instance, one, the Syed, is a priestly caste. Arains are never soldiers, yet they are both notified tribes.

45,123. You said one of the reasons why the Government had passed this Act was in order to prevent expropriation of land owned by soldiers?—The soldiers have lost heavily. Take for example the Rajputs.

45,124. What caste do you belong to yourself?—I belong to a non-notified tribe; I am a Kayastha.

45,125. Why do you describe it as a political move for the Government to try and protect the tribes from which soldiers come?—I have called this a political move because the Act would have been an economic measure or a measure in the interests of agriculture if it had reduced indebtedness, or, secondly, prevented expropriation of land, or had been in the interests of the scientific development of agriculture; it has done neither of these things.

45,126. You are not answering my question?—And it has tried to protect, though unsuccessfully, those people who are recruited into the Army; that is to say, only those tribes are notified who are either recruited for the Army or who have influence among those people who are recruited for the Army.

45,127. Would it not have been very shortsighted on the part of the Government not to protect the people on whom we depend for the maintenance of peace and security?—But I refuse to accept the statement that they depended for peace and security upon those tribes that are notified, and I also refuse to accept the statement that these military tribes have actually been protected.

45,128. *Mr. Calvert*: You may recollect that one of the alternatives to this Act was to raise the land revenue to a pitch which would take away the desire to acquire land; would you prefer to have that introduced?—No, I would not prefer that.

(The witness withdrew.)

The Commission then adjourned its public sittings till Tuesday, 8th March, 1927.

Tuesday, March 8th, 1927.

LAHORE.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.	Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.	Mr. H. CALVERT, C.I.E., I.C.S.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.	Professor N. GANGULEE.
	MR. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S. } *Co-opted Members.*
Mr. W. ROBERTS, B.Sc. }

Mr. J. A. MADAN, I.C.S., } *Joint Secretaries.*
Mr. F. W. H. SMITH. }

Mr. C. A. H. TOWNSEND, C.I.E., I.C.S., Commissioner, Jullundur Division, Punjab, and late Director of Agriculture in that Province.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(*a*) When Director of Agriculture, I felt very strongly that there was not and, I believe, still is not sufficient co-operation and mutual help between the Provinces on various problems of research. I mention one or two instances of this. The wheats that do well in the eastern or Ambala Division of this Province must also do well in the Meerut Division of the United Provinces, which adjoins it and *vice versa*, Our people at Lyallpur are working out their own salvation in this matter, and the people at Cawnpore, the centre of agricultural research in the United Provinces, are doing the same, but I do not think that the officers at Lyallpur and at Meerut have ever pooled their results. I also felt that the Imperial Department of Agriculture might be more helpful to us than it was. The Imperial Botanist, while I was Director of Agriculture, never once came to Lyallpur, and this although wheat is by far the most important crop in the Punjab, and he was probably the leading wheat expert of India. I think, though my information is not up to date, that the admirable work of the Central Cotton Committee of Bombay will, if it goes on as at present, largely destroy the force of this criticism so far as cotton is concerned. There should be, I suggest, *mutatis mutandis*, a Wheat Committee, a Sugarcane Committee, &c., working on similar lines. I give yet another instance of lack of co-ordination. The spread of *kallar* is one of the problems of Punjab agriculture. It is also, I understand, a serious problem in parts of the United Provinces and perhaps in other Provinces also. Surely those working at the problem in each Province should meet and compare their methods of attacking it, the results they have arrived at and the like.

(*c*) Until very recently, at any rate, fodder crops in the Punjab have not been investigated at all. It is quite time that attention was paid to them.

QUESTION 2.—AGRICULTURAL EDUCATION.—(viii) School farms and school plots are useful in this Province, but they should be multiplied enormously. I hope the Commission will find time to visit one or two of the vernacular middle schools that have small farms attached to them. I think it is very regrettable that economy some years ago caused the Government grant for such school farms to be reduced. As a result, school plots are in many cases

being substituted for them. The former are on a much smaller scale than the latter, and, though of some use, school farms are infinitely more so.

(x) In this connection, I think it is lamentable that the vacations given in Government high schools and some other schools in the Punjab do not coincide with the harvesting periods, when the farmers are most pressed for labour. In this Province, there are two busy seasons for the Punjab peasant. During them farmers always stand in need of assistance and largely enlist all available hands, including women and children, to help them:—

(1) The 15th of March to the end of May. In this period *rabi* is harvested and the sowing of cotton, sugarcane and early foddors is commenced.

(2) The 15th of September to 15th of November. This is the period when the *kharif* is harvested and *rabi* is sown.

So, to help the farmer, his son should get his vacation, if possible, during those seasons. The District Board primary and vernacular middle schools, it is true, get vacation twice a year for three weeks in April and three weeks in October. This is satisfactory. Government high schools, however, have six weeks' summer vacation from the second week of August to the 20th of September. The District Board high schools generally get the same. The District Board Anglo-vernacular middle schools generally get one month only in August. The Municipal primary schools get about one month's summer vacation. This shows that in too many cases vacations do not coincide with the period when there is the greatest demand for labour.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—The demonstration farms in many Punjab districts are, I consider, useful. They are particularly useful as providing peasants with good seeds and setts in the sowing periods, and during my three years as Commissioner, Jullundur Division, a good deal of work done by these demonstration farms has come to my notice. They should be multiplied greatly. There should be at least one in every *tehsil*, and if in any one *tehsil* there are tracts of widely differing agricultural conditions there should be more. Further, I think that the Department of Agriculture should, in addition to the large demonstration farm, have a smaller farm, of which the size should be the average holding cultivated by one man in that district, and should by actual experiments on it find out if the present mode of cultivation rotations, &c., followed in the district are the best possible or could be improved upon.

QUESTION 4.—ADMINISTRATION.—(*b*) Please see what I have already said in reply to Question No. 1 (*a*). The Military Grass Farms Department of the Government of India has acquired much useful knowledge. I think greater co-operation should exist between it and the Provincial Departments of Agriculture than is, I believe, the case at present.

(*c*) Many of the unmetalled or *katcha* roads of this Province are disgraceful, but the Communications Board is working at the problem and improving them. Every possible stimulus should be given to the Board to continue its work.

QUESTION 5.—FINANCE.—(*b*) The Punjab Government has desired that *taccavi* should be made more accessible to cultivators, and I have been deputed to investigate the matter in the Province. I have not, however, yet started my investigation.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*c*) The Punjab Land Alienation Act is extremely popular with the agriculturists of the Province. In Hissar, a poor district, in which I served for many years, I think that, had the Act not existed, most of the agricultural land would have long ago passed into the possession of non-agriculturists.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—The Co-operative Department has done admirable work in this Division in consolidating holdings. It is

extremely popular, and I personally regard it as the most valuable work done by the Co-operative Department. I hope the Commission will see some of the work on the spot.

QUESTION 8.—IRRIGATION.—(*a*) Water is the limiting factor in agriculture in those parts of the Province to which canal irrigation has not extended save in the sub-montane tracts where the rainfall is heavy and fairly reliable. So every possible encouragement should be given to the Department of Agriculture in investigating well irrigation. In, however, the Jullundur and Hoshiarpur districts in my Division, water level in wells has fallen considerably in the last thirty years. The reason for this it is impossible to ascertain definitely, but Mr. Wilsdon, who works under the Irrigation Department, is of the distinct opinion that it is due to an excessive number of wells being sunk. Incidentally I note that I consider it quite wrong that Mr. Wilsdon should work under the Irrigation Department. He should work at Lyallpur in the closest co-operation with the Department of Agriculture. On this matter, I feel very strongly.

QUESTION 13.—CROP PROTECTION.—Insects and rates do enormous damage to many Punjab crops. In some sandy parts of the Jullundur district, I have noticed that rats frequently devour much of the young wheat. The Entomological section of the Department of Agriculture is working at the problem. They should be given all possible encouragement.

QUESTION 15.—VETERINARY.—(*a*) The Civil Veterinary Department should be under the Director of Agriculture, but the head of the Civil Veterinary Department should have a free hand, assuming him to be a competent man.

(*b*) Veterinary dispensaries are partly under the control of Government and partly under the control of District Boards. They are very popular in the Punjab, and are being increased as finances allow. But the hilly parts of the Province such as Kangra, where communications are difficult and the cattle, as a rule, poor, should get more attention in this matter than they get at present.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*c*) Bee-keeping and poultry-rearing are not popular with the average Punjab peasant, because he despises these industries.

QUESTION 18.—AGRICULTURAL LABOUR.—In the Punjab, in good years there is an influx of labourers from Rajputana to help in cutting the wheat crop in the canal colonies. No special measure to attract agricultural labour is necessary.

QUESTION 19.—FORESTS.—I am strongly of opinion from a recent tour I made in Kangra, a hilly district, that grazing facilities are at present granted to the fullest extent compatible with the proper preservation of forest areas. Indeed, in many cases, I think, they have been granted to excess.

QUESTION 20.—MARKETING.—(*d*) About ten years ago, we arranged that the prices of cotton at Bombay should be posted in the principal markets of the canal colonies. The experiment was, I know, very successful when started in enabling the cultivator to get better prices for his produce. What, however, has been the fate of the experiment recently I do not know.

QUESTION 26.—STATISTICS. I feel very strongly that the recommendations of the recent Statistical Committee appointed by the Government of India are futile and impossible. During the war I was intimately concerned with the crop production, particularly of wheat, in the Punjab. I consider that it is quite impossible to give effect to the recommendations of the Committee, and that any attempt to do so would be not only useless but harmful.

Oral Evidence.

45,129. *The Chairman*: Mr. Townsend, you are at present Commissioner of the Jullundur Division?—Yes.

45,130. And at one time you were Director of Agriculture in the Punjab?—Yes.

45,131. For how long were you Director of Agriculture?—On and off for about seven years. I held other appointments during the War and after the War I reverted to the same post.

45,132. You have seen these matters from more than one angle of view. What do you think about the general question of appointing members of your Service to the Directorship of Agriculture as compared with the obvious alternative?—It depends on the men. If you have a thoroughly good member of the Agricultural Service, a man with good executive and administrative ability, I should be inclined to put him in; on the other hand there is no doubt that some members of the Agricultural Service, at any rate, prefer to have a member of the Civil Service as their Director rather than one of their own people.

45,133. In other words, if you have a man with sound executive and administrative ability in the Agricultural Service, by all means let him be appointed, but if you cannot get such a man, then you must go outside that service; is that your point?—Yes.

45,134. It has been suggested in certain quarters that the Agricultural Department in the earlier stages of its development and work has paid a great deal of attention to the canal colonies in the irrigated areas in general, and too little attention to the dry areas. Would you like to say anything about that?—There is truth in the criticism so far as the Punjab is concerned, and the reason is more or less obvious. In our canal colonies, centred at Lyallpur, we have, generally speaking, much more go-ahead and energetic agricultural people to deal with than in the *barani* tracts, and improvement of crops was in them easier than in the latter. There is more "commercial agriculture," if I might use the expression, practised on a large scale in the canal colonies than in the *barani* tracts; further, large firms exporting wheat and cotton have generally branches in them, and it is more easy to get into touch with them to find out what actually is wanted.

45,135. The Commission has also been told that although the suggestion to which I have referred is well founded, it does not mean that the policy of the department or Government was at fault, because it was necessary in the earlier stages to justify the creation of the Agricultural Department and to popularise agricultural research; the results were much more easily and readily obtained in the canal areas, and on the whole it was desirable that public interest in the canal areas should receive attention?—Yes.

45,136. Is it your view that the time has now come when the specific problems of dry cultivation should receive more attention?—I think this is already being done.

45,137. I observe that you take the view that the Civil Veterinary Department should be under the Director of Agriculture, but you are for the immediate head of the Civil Veterinary Department having a free hand, subject to the general control of the Director of Agriculture?—Yes.

45,138. You know the contrary view is very strongly held by some persons?—My own view is that agriculture in the Punjab is very intimately connected with the cattle industry from every point of view; and using the term agriculture in its very widest sense, I do not see how the Director of Agriculture is going to do his work unless the cattle department is

under him. As I say, the head of the Veterinary Department should be given a free hand, but the Director of Agriculture should control the general principles on which he runs his department.

45,139. Do you wish to add anything more to that which is already contained in your printed note?—No, nothing in particular.

45,140. I judge from your experience that there has been a want of touch between Province and Province in the matter of research and research results?—Yes.

45,141. Have you any suggestions as to how that touch might be secured?—To give an illustration, I might mention the case of the Imperial Wheat Expert who for some reason or other best known to himself never went to Lyallpur where we had an officer working on wheats. I think that such an officer in his or a similar position should, in order to co-ordinate the work and to pool the results of research, go round the country and discuss matters with local officers who are tackling the same particular problems and pool the results thus obtained.

45,142. *Sir James MacKenna*: That argument, I take it, does not apply to other members of the Imperial Department?—Not to the same extent.

45,143. *The Chairman*: On page 666 of your note, you suggest that there might be more touch between the authorities in charge of the Grass Farms Department of the Government of India and the Provincial Departments of Agriculture. Are you thinking of any purpose to be achieved by that touch?—No, I wrote this from my experience as Director of Agriculture. I used to consult the officers in charge of the Military Grass farms frequently, and I found that their experience was of much value to us, especially with regard to fodder crops; but whether that practice has continued or not I do not know.

45,144. *Sir Henry Lawrence*: Were the results of any investigations carried out ever reported to you?—No, they were just in the nature of general conversations which I used to have with these officers. An officer in charge of the Military Grass Farm at Ferozepore spoke to me about some experiments he had been making in well irrigation for tube wells. I wrote to the Agricultural Engineer suggesting that he might get into touch with that officer, as I thought the latter's experience might be useful to him; but whether he did anything in the matter I do not know.

45,145. Are the results obtained by the Military Grass Farms Department not accessible to the Civil Department?—They never came my way when I was Director of Agriculture; the position might possibly be different now, but I am not sure.

45,146. *The Chairman*: I see also, from page 666 of your note, that you have been deputed to investigate the problem of making *taccavi* loans more accessible to cultivators, and you have not yet started work in that direction. What are the terms of your instructions?—The matter is extremely indefinite so far. The Minister for Revenue desired, I understand, that *taccavi* should be made available in larger quantities to the agriculturist with less official red-tape than obtains at present, and required me to consider how this object could best be attained. I might say that only two or three days ago I made some inquiries on a matter in a *tehsil* (sub-collectorate) that I was inspecting. I found two gentlemen putting down tube wells; each of them had obtained an advance of Rs.10,000 for the purpose from Government about three months ago. I questioned the local *tehsildar*, and he told me that whatever money was wanted for such purposes was readily forthcoming; and that is also my own experience as Commissioner; if I want any money for the purpose, I always get it from the Financial Commissioner without trouble.

45,147. *Sir Ganga Ram*: For how many tube wells did those gentlemen receive Rs.10,000 each?—I do not know.

45,148. *The Chairman*: On page 667, you talk about agricultural industries and you say that bee-keeping and poultry-rearing are not popular with the average Punjab peasant, because he despises these industries. Would you regard it as an important contribution towards the economic advancement of the very small cultivator if he could be persuaded to take up some of these industries?—It would certainly help; for instance sericulture would help the residents in sub-montane tracts. When I said the average Punjab peasant I was particularly thinking of the Rajput whose contempt for things like poultry-keeping knows no bounds; one Rajput told me he would rather be dead than keep poultry; ploughing he did not despise.

45,149. *Mr. Calvert*: Is it not a fact that the Rajput also despises ploughing?—Not to any great extent; he considers the best thing is service in the Army and the next best to that he considers is agriculture.

45,150. *The Chairman*: I do not quite understand the implication of your words on page 667. You say: "I feel very strongly that the recommendations of the recent Statistical Committee appointed by the Government of India are futile and impossible." In what direction do you consider these recommendations futile and impossible?—I have read the report of the Committee in detail; the majority report recommends that there should be a census of production of all kinds throughout India. I gave evidence before that Committee and they quoted me in their Report. During the War I was intimately connected with the question of the production of wheat in the Punjab: and I found it was an extremely difficult problem. We took every possible method which suggested itself to find out how much wheat we produced. Finally, I adopted a plan of consulting officers of the Agricultural Department, Deputy-Commissioners and important cultivators as to what they estimated the wheat crop to be in their particular areas each harvest; and we made many crop cutting experiments. Having considered the results of all these lines of investigation, I framed the best possible estimate I could of the total outturn of wheat in the Province and went to Karachi, where I checked my estimate with those of the big wheat exporting firms. Not infrequently I changed my estimates as a result of my interviews with them. But I consider that the sort of census of production which has been recommended by the majority report of the Committee is entirely absurd. If the Government of India were to embark on this policy, they would have to spend a very enormous amount of money, and it would be quite useless.

45,151. *Sir Henry Lawrence*: Which Committee is this?—The Economic Inquiry Committee.

45,152. *Mr. Calvert*: That was a recommendation made in the majority report of that Committee?—Yes.

45,153. *The Chairman*: What you say does not refer to the reservations of the Minority Report?—No.

45,154. Are you in favour of crop cutting experiments?—Yes; I think that many more of them should be made than is the case at present.

45,155. With regard to the question of *taccavi* loans, may I know whether in the course of your investigations you are going to take into consideration the problem of the co-operative credit society in its relation to *taccavi* loans?—Yes; I had a long conversation on the subject with an official of the Co-operative Department at Jullundur the other day; he said that the money to be distributed should be given to his Department: I said that I reserved my opinion.

45,156. *Sir James MacKenna*: I should like to know what impression you formed of Pusa during the seven years that you were Director of Agriculture?—It was not of very much use to us; it was too far away.

as a matter of fact, I do not know that it could have been of much use to us.

45,157. What is your view about central research as apart from provincial research? Do you think there are any problems of the Punjab which should be tackled by a Central Research Institute run by the Government of India?—Yes. For instance, the problem of *kallar* might well be a central research subject.

45,158. In other words, certain general problems you consider should be centrally attacked?—Yes.

45,159. What about my friend Mr. Wilsdon? Where would you put him? Would you put him at Lyallpur?—I would put him at Lyallpur where there are laboratories, not so much for Mr. Wilsdon's sake but for the sake of the Agricultural College and other people working there.

45,160. With regard to the question of placing the Civil Veterinary Department under the Director of Agriculture, have you ever looked at the matter from the point of view of the professional pride of the Veterinary Department?—Yes, the point was forcibly impressed on me by officers of the Veterinary Service when I was Director of Agriculture.

45,161. Do you not think that in this Province, where you have a Development Commissioner to co-ordinate all these branches, you might, having due regard to the professional pride of the Veterinary Department, place this department under the Development Commissioner?—Personally I am of opinion that agriculture is a very comprehensive subject and has a most intimate connection with veterinary work, and therefore it should have the Veterinary Department under it.

45,162. Why not also have the Co-operative Department under Agriculture?—No, because that includes many other things than agriculture.

45,163. *Professor Gangulee*: You say on the first page of your note that you do not think that the officers at Lyallpur and at Meerut have ever pooled their results in connection with their research on wheat. Could you tell us what were the reasons?—The officers were working at some distance from each other (say 24 hours' rail journey) and independently of each other. They never met and compared difficulties and results. I think they might well have done so. Pusa and the officers of the Imperial Department were a long way off; but I see no reason why the officers of the Punjab and the United Provinces Agricultural Departments should not have met at intervals to compare results and the like.

One, of course, understands the difficulties which the provincial research workers might have in coming in contact with Pusa itself, but the point here is why could not the Punjab Government and the research officials co-operate with the United Provinces people.

45,164. What were the difficulties?—It was never even suggested by the Government of India or the Punjab Government that they should meet. Perhaps I was myself to some extent to blame in the matter for not suggesting it to them.

45,165. What do you think of the standard of agricultural education given at Lyallpur?—I think it is fairly good; I have been to Cawnpore and Nagpur, and I have seen some agricultural colleges in England and Ireland; I think for an Indian college Lyallpur is pretty good; but it is not nearly as good as an English agricultural college.

45,166. I think they admit matriculation students now, do they not?—I have been out of touch with the department for three years; I think so, but I am not sure.

45,167. Would you like to have intermediate science students admitted? That would save one year.—I think they will have to do something like that; I should like to consider the idea; it seems to be good.

45,168. You attach a great deal of importance, I see, to school farms what sort of area would you like to have attached to the ordinary schools! What would be the economic unit?—I was yesterday investigating what i the average size of holding which is cultivated by a self-cultivating pro prietor in the Jullundur Division. It works out at about five acres in th Jullundur district, which is much less than in the Province as a whole where it runs to two or three times that area. I should like, therefore, t have five acres in each school farm in the Jullundur district. In othe districts, the conditions vary; in Kangra, where the holdings are muc smaller, you would have to be content with one acre.

45,169. Do you think the school teachers are, as a rule, capable of managing these farms?—The teachers in charge of these farms have been at the Agricultural College at Lyallpur for one year. Some of them are successful and some are not; much depends on the personality of the teacher; but they do a certain amount of good. Recently the Department of Education has considerably cut down the amount of money to be spent on each of these farms. Government said that they should be of three acres each, and that the land should be bought for Rs.350 per acre. I wrote at once to Government and said: "You cannot get an acre of land for Rs.350 in most of my Division; it is absurd."

45,170. Would you like to see more demonstration farms or would you like to develop the idea of carrying on demonstration on the cultivators' own land?—There is not a great deal of difference between the two if you analyse them. But if you can get cultivators who are willing to co-operate wholeheartedly with the department and will adopt its suggestions, I think demonstrations carried out by the department on the lands of such cultivators are in many ways preferable to those carried out on demonstration farms; one good reason is that you can move them about from village to village; you are not tied to one place as is a demonstration farm. They are also much cheaper. But demonstration farms have advantages of their own. For one thing, work can be carried on on them for a series of years.

45,171. Do you think legislative measures are necessary with regard to consolidation of holdings or do you think the voluntary method through the Co-operative Department will achieve the desired object?—I think it would be very unwise to resort to legislation for this purpose at present; the co-operative movement is now doing very excellent work in the Jullundur District in the matter and has achieved very great successes in many cases. In some cases, they are not successful owing to obstinacy and recalcitrance of certain men. I think it would be a mistake to have legislation on the matter until public opinion on the advantages of consolidation is more awake.

45,172. At the present time, veterinary dispensaries are partly under the control of Government and partly under the control of District Boards; do you think this arrangement is satisfactory?—It is not ideal but it works, as many things do in India; Government pays the Veterinary Assistant and gives large grants to the District Boards. Our veterinary dispensaries are extremely popular; we have been steadily increasing them; there is a great demand for them in many parts of the Division.

45,173. You have known this Province for about twenty years or more?—Yes; I know some parts of it much better than others.

45,174. Do you think the standard of living has in any way changed?—I think it has risen considerably; coolies who years ago never ate wheat, eat wheat now. I have no doubt it has risen; coolies used to eat millets and now they eat wheat, which is a much better food. It is quite true that prices have risen, but wages have risen much more.

45,175. On the whole there has been a great deal of improvement?—I think so, undoubtedly; I think any fair-minded man would have to say so.

45,176. *Mr. Calvert*: Would you venture any opinion as to the economic value to Jullundur District of emigration abroad?—If I had known you were going to ask me that, I should have investigated it. All I can now say is that emigration abroad is of very great value to the district. An enormous amount of money which is remitted to people in Jullundur from abroad is America and Brazil and indeed all parts of the world. I discussed the matter with the Agent of the local Bank at Jullundur; he told me the amount of money which is remitted to people in Jullundur from abroad is astonishing.

45,177. *Sir Ganga Ram*: Mostly pensions?—No, not so much pensions; friends and relations send the money. Many of the Jullundur people have friends and relations in foreign countries, especially on the Pacific coast of the United States, who transmit thousands of rupees to their fathers and brothers in their home district.

45,178. *Mr. Calvert*: It is a valuable palliative in the Jullundur district?—Very much so.

45,179. Do you recollect hearing any complaint from villages bordering on Indian States as to wild animals coming in and doing harm?—Such complaints have not come to my notice. You do not ask me the question, but I have received grave complaints in regard to Indian States as to protection against diseases of animals, especially in Kangra, one half of which district is surrounded by hill States which do not inoculate animals at all against rinderpest and similar diseases. I have written to the Financial Commissioner asking him to try and apply pressure in the matter on these States.

45,180. The average cultivator's holding in Kangra as just worked out by me is 1·7 acres per cultivator. Do you think much can be done for a man with a small holding like that living by agriculture alone?—I think it is an exceedingly difficult problem. The Kangra district is the poorest in my division; I have every sympathy with the people there; they did magnificently in the War; they are extremely poor and perhaps their land revenue assessment is a little higher than that of the people in the plains; but how to help them is extremely difficult. I have got a note from the Deputy Commissioner as to how the Agricultural Department can help them; his Revenue Assistant says that nothing can be done for them by the department unless everything is given free! They are very conservative, extremely religious and superstitious and they offer the most difficult problem in my Division; it is quite different from anything in the plains.

45,181. It has been said to us that in Kangra, owing to the facilities of obtaining wood fuel, cow-dung is not burnt as a fuel as much as in the plains districts; would you agree with that?—I have not particularly investigated the point, but I should certainly think there is some truth in it; wood fuel is obtainable with much greater ease in Kangra than in plains districts.

45,182. The evidence that was actually given on this subject was very contradictory; some people say that the cultivators use cow-dung as fuel because they cannot get wood fuel, while others say that, when the Forest Department provides wood fuel they will not use it but still go on using cow-dung. I was wondering how far the use of cow-dung as a fuel is due to the lack of wood fuel?—I think if there was limitless wood fuel available, people would prefer cow-dung for cooking many things, because it smoulders and keeps things simmering, which is what they want. Indian witnesses can tell you about this better than I can. As to Kangra, I think there is no doubt that wood fuel is much more easily available there than in the plains, but nevertheless they al a lot of cow-dung fuel.

45,183. *Mr. Kamat*: On page 666 of your note, you refer to the Punjal Land Alienation Act which you say is extremely popular with the agri culturists of this Province. This is a question which has some bearin on other Provinces and I want to see how far the Land Alienation Ac has benefited this Province. If it is popular with the agriculturist, is ther any section of the people with whom it is unpopular?—There is.

45,184. Has this Act really served its purpose in the sense of keepin the moneylender class down or is the moneylender class growing in spit of the Act?—I do not think the object of the Act was to keep the money lender class down; that class performs many useful functions. The objec of the Act was to prevent the moneylender from expropriating the heredi tary agriculturist of the Punjab and in that object it has been very largel successful.

45,185. On page 194 of the Memorandum presented to us by the Punjal Government, we are told, with reference to an investigation of indebted ness in villages, that agriculturist moneylenders have risen in numbe during the last twenty years or since the passing of the Punjab Land Aliena tion Act, approximately from 11 to 102, while even non-agriculturists money lenders have risen in the same time from 26 to 44?—I have not seer the memorandum.

45,186. You may take it that, this being a Government memorandum, it must be correct?—Undoubtedly.

45,187. If it is correct, I want you to explain these figures and t explain how, in spite of the passing of this Act, during the last twenty years or so agriculturist moneylenders have increased from 11 to 102?—They have certainly received an impetus since the Act was introduced.

45,188. But still you say the Act has served its purpose?—It has not served the whole of the purpose for which it was started, but that it has been very successful on the whole I maintained and still maintain, and I adhere to my view that it is extremely popular with the agricul turists of the Province.

45,189. That is one section of the people?—I say the agriculturists; you can interpret it as you like. I was many years in Hissar where most of the agriculturists, who are Hindus, are very enthusiastically in favour of the Act; they did not look forward with the least pleasure to any change of it.

45,190. Is it a provision of this Act that land can be transferred only within each district, that is to say, from one man in the district to another man in the same district?—A non-agriculturist may sell land to anybody he likes and an agriculturist may sell land to an agriculturist wherever he likes, whether in his district or outside it. I am speaking from memory. An agriculturist in Lahore can sell his land to an agriculturist in Jullundur if he likes.

45,191. *Mr. Calvert*: They must be in the same group?—I have not got the Act with me.

45,192. *Professor Gangulee*: It is confined to the same district?—Yes. I find that is so.

45,193. *Mr. Kamat*: Does not that strike you as a strange provision of an Act in the interests of agriculture? Let us take a case in England: A retired Professor of Oxford, for instance, wants to do in his retirement a little farming and wants to buy a piece of farming land in Devonshire; you prevent him from getting it in Devonshire and drive him to Scotland. How would that strike you?—In the first place, I do not think the parallel is complete; Devonshire is not in the Punjab; our conditions are entirely different. If the Act was really a burden on the agriculturists of this Province, they would have asked to be allowed to sell their land to

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agriculturists of other districts. They have not, generally speaking, done so. At present, as Mr. Calvert reminds me, they are only allowed to sell to agriculturists in the same group, that is to say, to people who belong to their own district.

45,194. Since the passing of this Act, a number of new factors have arisen in this Province, for instance, the establishment of the Agricultural College turning out agriculturists, the establishment of canal colonies; all these things have taken place, and do you think the time has come to re-examine this question at the present moment?—No, not at present; I can give you reasons for my opinion if you desire it. It is that, at present, the Hindu-Mahommedan question is very much with us; communal feeling is very bitter in this Province at present, and I therefore think that it would be most undesirable to raise this matter at present.

45,195. Mr. Darling, who came before us, was of opinion that the question should be examined to some extent; would you agree with that?—I think that it would be most undesirable to raise this matter at present.

45,196. I will illustrate what I mean by an example: supposing there were two persons living in an urban area both practising at the Bar; supposing one is classified as a man belonging to an agricultural tribe because his ancestors carried on agriculture, while the other is not; one can go and grab ten or twenty thousand acres of land though he is living in Lahore, while the other cannot; do not you think that is an anomaly?—You say one man can grab land; I would not let either grab.

45,197. Instead of the word "grab" I would say "take land," merely on the ground that his ancestors did agricultural work?—Your second man can often buy land from some other non-agriculturist who desires to sell, and he can, not infrequently, find an agriculturist who is very indebted and wants to sell. In such cases, the sanction of the Commissioner has to be obtained for the alienation. At Jullundur, I receive, I should think, one recommendation per day from one or other of the five Deputy Commissioners in my division for permission to sell land belonging to agriculturists to non-agriculturists. If the Deputy Commissioner recommends such sale, I almost always agree. I mention that point as showing that the non-agriculturist is not absolutely debarred from buying agricultural land.

45,198. But he has to depend on the recommendation of the Deputy Commissioner?—I usually follow that recommendation, and always attach great weight to it.

45,199. Supposing a man goes to America, learns horticulture there and wants to help horticulture here by improved methods, he will have to depend by law upon the good will of the Deputy Commissioner?—The only Punjabi I know who has been to America and learnt horticulture there is Sardar Hardit Singh. Government has given him every facility; they have appointed him Fruit Specialist.

45,200. *Mr. Roberts*: In the year 1899-1900, we had a very severe famine in six districts in the South-East of the Province: Hissar, Gurgaon, Rohtak, Karnal, Ambala and Delhi, when a million and a quarter cattle died. Has anything been done to your knowledge in the way of increasing irrigation in that tract?—I was in Hissar for nine years in various capacities. Irrigation is slowly increasing there, but I left the district eleven years ago. I understand, however, that when one of the big projects for damming the Sutlej comes into being there will be more irrigation in that tract. We had at one time a big project for bringing Ganges water across the Jumna; it was known as the Sarda project.

45,201. I think that has been abandoned?—Yes; but certainly the more canal irrigation they can bring into that tract, the better.

45,202. As far as you know, no big scheme has been carried out?—That is correct, but some big scheme may be under consideration for the future.

45,203. There is no reason why a similar famine should not occur?—I hesitate to say that, because in the last fifteen years the system of carrying fodder by rail has been very largely extended in this Province.

45,204. It would be easily met?—At any rate, to a large extent. If a Deputy Commissioner sees that fodder is very short in his district, he applies for fodder concessions and is allowed to get the fodder his people require carried from various places where it is plentiful at half rates so far as carriage by rail is concerned. That practice has been largely extended in the last few years.

45,205. That would be a mitigation?—Yes. Cattle would undoubtedly die, but it would be a help.

45,206. Would you be in favour of the establishment of a large-scale fodder reserve, if it could be done, in some systematic way?—Undoubtedly, if it could be done. It would be an admirable thing, but it would not be easy to work out.

45,207. You are probably aware that the Bhakra Dam project is meant almost entirely for these tracts?—So I have heard.

45,208. I understand that the water rates which would have to be charged are higher than are allowed by the rules, and that that is what is keeping the project back. From the point of view of providing for this large area, do you think it would be a good thing to waive the question of rates?—Certainly. Speaking generally, unless the difference in money is very large, I think it ought to be done.

45,209. With regard to the relation between the Irrigation Department and agriculture, I think some proposal was made in your time for an experimental station?—Yes.

45,210. A station was to be established for studying the problems involved?—Yes.

45,211. You were strongly in favour of that?—Yes.

45,212. You think something should be done?—I have been out of touch with the Agricultural Department work for the last three years, but from what I knew at the time, I should certainly think so.

45,213. I think you would agree that consolidation of holdings is the main agricultural improvement that we need in certain tracts?—It is undoubtedly extremely important. Perhaps, speaking generally, our first need is the provision of water in those parts of the Punjab which have not got irrigation, whether from wells or canals, but after that, I should put consolidation of holdings, though not in all parts of the Province.

45,214. Only in certain parts?—Yes, the centre of the Province.

45,215. *Sir Henry Lawrence*: You have seen the development of agriculture on the canal colonies for some years?—On and off.

45,216. By what method have colonists who were not previously agriculturists been taught to cultivate their land?—I have not given the matter very close study, but I take it they imitated the people who were there before. Most of the colonists had been agriculturists before, and those who had not been so, generally gave their land, as they do now, on rent to agriculturists.

45,217. A considerable section of the colonists were pastoral people before?—Yes.

45,218. They did not know how to use a plough?—I think they could, roughly, and they have gone on learning since then.

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45,219. Has any method of instruction been adopted by Government for their improvement? Has any specific plan been tried?—None that I can remember. There were Agricultural Assistants at work in the Lyallpur district and they doubtless gave these people attention, but no special Agricultural Assistant was appointed for these people.

45,220. Do you think more rapid improvement might be made in the agriculture of these less-educated people by Government effort?—It must be remembered they are generally very backward educationally and very averse to adopting suggestions, but the experiment might be tried of appointing a special Agricultural Assistant to work among them. He would have to be carefully selected and would have to be a Mahommedan, because these people are principally Mahommedans. It would be a fatal mistake to send a Sikh Agricultural Assistant to work amongst Mahommedans, or *vice versa*.

45,221. You would have peripatetic demonstrators?—Yes. Already the Agricultural Assistant engaged on district work is a peripatetic demonstrator.

45,222. You would multiply such men and give them special instructions to devote attention to people who were not experienced in cultivation?—That is on the assumption that their lack of experience is very marked. I am afraid I did not pay attention to these people when I was Director of Agriculture, but if they are particularly backward in any tract it might be well to pay attention to them.

45,223. By the new Sutlej Barrage project, irrigation is being taken to areas which have not had perennial irrigation before?—Yes.

45,224. Is there any scheme now in view for teaching the cultivators in those areas how best to make use of perennial irrigation?—I cannot tell you. One canal that takes off from Ferozepore will irrigate part of the Ferozepore district, but that is at present irrigated by what we call the Grey canals, and that is the only part of my division affected by the scheme.

45,225. While you were Director, no scheme for teaching perennial irrigation-agriculture in advance of the Sutlej system of canals was adopted?—No.

45,226. Do you think it would be desirable that in the case of any new schemes this should be done?—The proposal merits careful investigation. *Prima facie*, it seems a good idea, but I would like time to consider it before giving a definite opinion.

45,227. How are you going to teach perennial irrigation in an area which has not got perennial irrigation already?—Do you mean, teach them how to use the water economically?

45,228. Yes, how to make the best use of it?—The people will find out for themselves by a system of trial and error.

45,229. Can it be done in advance of the scheme?—You cannot teach them how to use water unless you have the water, and you will not get the water until you get the scheme.

45,230. Have you any places where there is perennial water which can be utilised for this purpose in these areas?—None that are not a long way off. It would mean taking these people from fifty to a hundred miles, and it would be extremely difficult to get them to go such a distance. The Grey canals are not perennial.

45,231. Is there any irrigation now taken from the Sutlej river direct?—Very little, because, as a rule, the banks of the river are very sandy, and it is only in rare cases that the actual water adjoins cultivated land.

45,232. It has a shifting bed?—Very much so.

45,233. And there are no places where it runs between permanent banks?—Except in the hills, not in my division.

45,234. With regard to irrigation experiments, Mr. Roberts, to whom you referred, put up some scheme. Can you tell us what the character of that scheme was?—There was a large area at Roda Koru, some miles from Lyallpur, and the Irrigation Department and Mr. Roberts were very anxious that this area should be taken up and a special officer appointed from the Imperial Agricultural Service who would study this question of the most economical use of water from every aspect, from the point of view of the Irrigation Department, from the point of view of the agriculturist and from the point of view of the physicist. He was to work in close co-operation with the Irrigation Department. However, money was the difficulty (the War was on), and what has happened to the scheme I do not know. Water is, generally speaking, our limiting factor in the Punjab. We have these very large canals, but no canal colonist is as a rule satisfied with the amount of water he gets. We are also getting to the end of our possibilities so far as big canals schemes from rivers are concerned, and much more attention will have to be paid in the future than was paid in the past to making the right use of such water as we have at present. I am, therefore, entirely in favour of having a big research station to deal with this matter, such as that which Mr. Roberts mentioned. It is most important, and it is regrettable it has been neglected.

45,235. So far as you know it has not been established yet?—Not so far as I know.

45,236. Could you let us have a copy of the scheme which was put up for the working of this institution?—It is in the office of the Director of Agriculture.

45,237. *Sir Ganga Ram*: You are having considerable difficulty with your water-supply from wells in the Jullundur district?—The water-level has fallen, undoubtedly.

45,238. Is there any emigration from that district in consequence?—No.

45,239. Are not many people now going to Sind because they cannot get sufficient water?—People from Jullundur are certainly going to Sind, but I doubt whether they are doing so because of the shrinkage of the water-table. I think they would go in any event, because in Jullundur the cultivator is enterprising, and when he hears that land is available somewhere he will go to it.

45,240. They have been going for some time?—Yes.

45,241. Are not their numbers increasing now owing to the difficulty of getting water from wells?—I have not noticed this tendency.

45,242. Have you not thought of supplementing your irrigation by lift irrigation from the Beas river? Have you any scheme for that?—Last August, the Beas river, which runs on the west side of my division and which is there raised above the ordinary level of the country, nearly broke its banks. There is a big *bund* in the Hoshiarpur district, which it threatened to break. The matter is very serious; at present a staff is investigating remedial measures, one-third of the cost of which is being paid by the Punjab Government, one-third by the North Western Railway and one-third by the Kapurthala Durbar. If the river were to break through this *bund*, it would flood an enormous area of country. In this connection, I recently wrote a private letter to His Excellency the Governor suggesting it might be considered whether an inundation canal run in the *kharif* season could be taken out of the Beas to irrigate those parts of the Jullundur and Hoshiarpur districts in which the shrinkage of the water-table was most

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marked. His Excellency replied that part of the Hoshiarpur district was waterlogged (which is undoubtedly the case), but told me to investigate the project further. I have written to the Deputy Commissioners of the two districts concerned, and they are looking into the matter, but I have not yet received their reports.

45,243. Such a scheme would be quite feasible?—Apparently we could only run an inundation canal in the tract for the summer months, and whether the contours of the land would allow its construction, I do not know. A detailed survey has yet to be made.

45,244. *Sir Thomas Middleton*: Do you think that if the Imperial Botanist had been stationed at Delhi instead of Pusa, he would have been more frequently in Lyallpur? Is it not the distance of Pusa that prevents him coming?—No. I do not think the then Imperial Botanist would in any circumstances have come to Lyallpur.

45,245. Would the other members of the Pusa scientific staff, if located nearer Lyallpur than at present, be of more use to you than they have been?—I think so.

45,246. The distance of Pusa is an objection from your point of view?—Yes, and the problems there differ from our problems here.

45,247. Would problems arising at Delhi be similar to the problems which arise here?—The problem of alkali land would be and probably others also.

45,248. You take the view that the Veterinary Department should be under the Director of Agriculture. Assuming personal fitness, would you agree that in that case there would be nothing to prevent the chief veterinary officer becoming Director of Agriculture?—I theory, I can see no reason why I should reply in the negative; but agriculture (in its widest sense) includes veterinary work. The converse hardly applies.

45,249. Just as an agricultural chemist might become Director of Agriculure?—I see no reason why he should not. It all depends on the man.

45,250. When you were Director of Agriculture, had you charge of crop-cutting experiments, or were these done by the Revenue Department?—I was in charge of them in those districts in the Punjab in which I had an agricultural staff, that is to say in about half of the twenty-nine districts that lie in the Punjab.

45,251. Does that method of conducting those experiments still continue?—Yes, I believe so.

45,252. Who actually makes the experiments? Who measures the crop, sees it cut and weighs up the produce?—Subordinate Revenue officials. They are responsible officers.

45,253. Officers of the Revenue Department?—Yes. I am speaking of those districts where the work is done by that department. In the other districts, when I was Director of Agriculture, it was done by Agricultural Assistants.

45,254. Had you any opportunity of comparing the value of the crop experiments made by the two groups? Would you regard them as being equally useful?—They were both useful, but perhaps I was prejudiced in favour of those made by the Agricultural Department. We took more interest in it. I made a lot myself.

45,255. You express a strong opinion in favour of the school farm as opposed to the school plot in connection with vernacular middle schools?—Yes.

45,256. Would you briefly indicate the value of these school farms at the vernacular middle schools as compared with school plots?—On the school farm everything is done on a rather larger scale than on the school plot.

They generally have a well for their own use, and a pair of bullocks. A school plot is miniature to a degree, whereas a school farm may be two or three acres in extent.

45,257. The school plot can familiarise the pupils with plants. What does the school farm do in addition?—For one thing, you can use a Meston plough.

45,258. You get instruction on tillage with a school farm?—Yes, and you cannot get it with a school plot.

45,259. Is any instruction being given in your school farms on animal husbandry?—Very little.

45,260. Any instruction in accounting?—The idea of these farms is that they should pay for themselves, so that there is a certain amount of accounting done, but how far the students are made to participate in the work I do not know.

45,261. The school farm is a good deal more expensive than the school plot, and I want to see what are the various things that the school farm can take up?—I hesitate to give you a reply without some thought. But there is an officer of the Education Department whose sole duty it is to inspect school farms and school plots; he would doubtless be able to furnish you with all the information and the various details that you may want.

45,262. How many demonstration stations have you in the Jullundur Division?—Only two, one at Jullundur and another at Ferozepore.

45,263. How many *tehsils* have you in the Jullundur District?—Four *tehsils*.

45,264. Would you like to have a farm in each of these *tehsils*?—Yes.

45,265. At present, you have only two or three for the whole division?—Yes.

45,266. Have you seen at any time reports of the Military grass farms dealing with such questions as the value of the different breeds as grazing animals?—I have not been Director of Agriculture for many years now, but I do not remember having seen any.

45,267. You had no opportunity of getting any technical information which they might have accumulated?—I used occasionally to be shown round the Military farms and the authorities were always most courteous to me. There was certainly no set programme of co-ordination.

45,268. You express strong views in favour of the consolidation of holdings in certain divisions. Would you apply compulsion if the owners of say 51 per cent. of the affected land were in favour of consolidation?—No.

45,269. Not even if 75 per cent. favoured it?—No.

45,269A. Then under what circumstances would you apply compulsion?—I would not apply compulsion at present, in any circumstances.

45,270. Would you prefer to trust as at present to the co-operative movement?—Yes, that Department is doing admirable work in this direction, and the people are learning the benefits of consolidation without being subject to any measure of compulsion at present. I would not advise compulsion for some years to come, at least not until public opinion in the matter is more firm.

45,271. *Mr. Barron*: With reference to the question of agriculturists and non-agriculturists purchasing land, can you tell us whether agriculturists from the Jullundur division are buying land in Bikaner in the new canal frontier division?—Yes.

45,272. Have you heard of any non-agriculturists also buying land in Bikaner?—I cannot think of any at this moment.

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45,273. Turning to the question of trade statistics, you know I presume that we, in the Punjab, used to prepare rather elaborate statistics of the movement of trade both internal and external, and those statistics have been abandoned, have they not?—Yes, the report on internal trade certainly. I do not know about that on external trade.

45,274. What is your opinion about the value of those statistics?—I found the report on internal trade statistics extremely valuable when I was Director of Civil Supplies during the War and also when I was Director of Agriculture. I consider that its abolition was most illadvised. The internal trade report gave you figures with regard to the articles imported and exported by rail from and to the Punjab and, although the figures were not absolutely accurate, because you have always got the human element, yet they were of very great value. I protested strongly against its abolition.

45,275. Would you like to see it reintroduced?—Yes.

45,276. Are you aware of the fact that the Punjab Government is considering the matter?—I believe they are.

45,277. Were you Director when two experiments in bee-keeping were made, or at any rate have you heard of those experiments?—I cannot remember.

45,278. You do not remember if they were failures?—No, I do not.

45,279. *Mr. Calvert*: The name of the gentleman was Mr. Cousins; he tried bee-keeping in the Simla hills, and when he died, there was nobody else to carry on the experiments?—Yes, I remember the case; he tried the experiment only in the hills.

45,280. *Mr. Barron*: Have you ever seen any of the honeycombs that come down from the frontier?—Yes.

45,280A. Is there anything produced in the Punjab like the combs from the Frontier hills and Afghanistan?—Not so far as I am aware.

45,281. Would you not think that the climatic conditions in the Punjab as a whole were unfavourable for any such scheme as bee-keeping?—Yes, I think so; it was Mr. Cousins' distinct opinion that it should be tried in the hills and not in the plains.

45,282. So that any such proposal would only apply to a small area in the hills?—Yes.

45,283. *The Raja of Parlakimedi*: What fodder crops are popularly grown by the cultivators round about?—Great millet is very popular; it is by far the most important fodder crop grown in the autumn season. In the Punjab, it is known as *chari*. In the winter season we grow crops of the clover family (I think they belong to it) known as *senji* and *maina*. We also grow lucerne. But charri is our most important fodder crop. Wheat straw is important also. *Chari* is not grown for the sake of the grain it produces, but for the straw.

45,284. Are they in the habit of preserving fodder?—Yes, in some parts of the Province; *bajra* stalks and *chari* are often kept for three or four years on the borders of Rajputana.

45,285. Is preservation by silo pits popular?—No; it is not known in my division. I think the Agricultural Department do a little in that matter.

45,286. Proper demonstration is not done?—It has been demonstrated in the Kangra district, but whether anything is really possible in that direction I do not know. I do not think so. So far as the Kangra district is concerned, fodder is not a serious problem; that district gets a good deal of rain.

45,287. Is there any export of green fodder from these irrigated districts to the unirrigated districts in the summer?—Not that I know of.

45,288. Do not the people possessing milch cattle prefer to have this?—Yes, but if you carry green fodder by rail or cart from one place to another, it is no longer green by the time its destination is reached.

45,289. I am thinking of very short distances in the neighbourhood?—Yes, it is taken short distances by cart; I have never seen it going more than five or ten miles.

45,290. What are the recognised agricultural industries in this Province?—How do you define agricultural industries?

45,291. I mean by-industries?—I do not think there are any; the Punjab agriculturist is a whole-time agriculturist and therefore does not take up side issues.

45,292. So that, even in the summer, there is enough for him to do?—In many parts of the year he does not have much to do, but at other times he is overworked, with the result that when he has nothing to do he prefers to go home and enjoys his *dolce far niente* by smoking a hookah and gossiping to his friend.

45,293. In your note, you say that bee-keeping and poultry farming are not taken up by certain castes. Do you not think that they would take up cattle breeding?—A good many people in the Province take to cattle breeding as it is. I regard it as forming part of agriculture. In Hissar and Rohtak there is much business done in the export of cattle. Many villages round Hissar specialise in breeding young stock for sale and make a lot of money out of it.

45,294. Do you think the Department is doing sufficient in the way of encouraging cattle breeding in this Province?—I think they took a very wise step in appointing a Cattle Specialist in the person of Mr. Branford.

45,295. Have you any system, such as the Bombay Presidency are adopting, of premium bulls?—No; but the District Boards provide a certain amount in their budgets for the purchase of, say, ten bulls from the Hissar farm at the rate of Rs.250 for each bull; then each year the Superintendent of the farm writes to the District Board to send men to take their bulls. The bulls are taken away and told off to certain groups of villages; they are allowed to wander about the villages, and anybody can have his cows covered by them. There is no systematic control of these bulls; they are allowed to wander about the place just as Brahmini bulls. There are also many worthless bulls knocking about. In some districts the conditions are different and the bulls have to be tied up. As to the number of bulls obtained by local bodies, the Provincial Veterinary Report shows that for the year 1925-26 local bodies in the Punjab obtained from the Hissar Cattle Farm 557 new bulls.

45,296. How many District Boards are there?—There are 29 District Boards in the Province. Hissar bulls are not suitable to much of the Rawalpindi Division; in it the Dhanni breed is popular, and is encouraged by Government.

45,297. Do you think that the Department is taking sufficient interest in protecting milch cows in the big cities in this Province? In other parts of India, the *gowalas*, with a view to increase the milk supply, neglect the calves or adopt some other means which ultimately make the milch cow practically useless, the cow becoming entirely dry. Is there any such practice here?—I have not studied the question much, but I do not think the practice obtains to anything like the same extent as in Bombay.

(The witness withdrew.)

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Mr. W. MAYES, F.C.H., Chief Conservator of Forests, Punjab.

(The witness was examined on the note in the Punjab Memorandum on "The Relation of Forestry to Agriculture in the Punjab," reproduced below.)

The Relation of Forestry to Agriculture in the Punjab.

The area of forest under the control of the Forest Department is 6,700 square miles, or about 7 per cent. of the total area of the province. Roughly 2,500 square miles of these forests are in the plains and 4,200 square miles in the hills. Further areas of waste and forest are controlled by other Civil or Military authorities, and there are considerable areas of valuable forest in some of the Punjab States. The whole area of forest land is not 10 per cent. of the province, and more than half of this land is waste, not actually bearing forest growth. On the continent of Europe, one acre of forest per head of population is the minimum to make a country self supporting in forest produce; in the Punjab as a whole, there may be ½ acre of forest per head of population, but the area is a very small fraction of an acre in the plains where the population is dense and the forests are few.

Some idea of the importance of forests to agriculturalists of the Punjab may be formed from the fact that produce to the value of about Rs.30 lakhs is removed annually free of charge by right-holders from the 6,700 square miles of forest under the control of the Forest Department. Further large quantities of forest produce are sold at nominal rates, or obtained from forests not under the Department's control.

Rights to grazing or grass cutting are those most commonly enjoyed; less than 500 square miles of forest are entirely closed to grazing and partial closure is enforced in a further 700 square miles only. The value of these rights is estimated at Rs.20 lakhs per annum, while about Rs.2 lakhs is realised annually as grazing and grass cutting fees where rights have not been admitted.

Rights to firewood and timber are next in importance and it is estimated that 25 million cubic feet of the former and a million cubic feet of timber are removed annually free of charge.

Apart from these principal rights, there are many others of importance to an agricultural population, and the incalculable value of forests in times of fodder famine may be emphasized.

2. Forestry in relation to agriculture needs to be considered separately in the plains and in the hills of the Punjab. In the plains, where extension of irrigation is making intensive agriculture possible over large areas of former waste, some 3,000 square miles of forest have been disforested in the past 25 years and 2,500 square miles remain; well over a further 1,000 square miles of forest are already destined for colonization shortly. To take the place of this natural forest about 80 square miles of irrigable land has been taken up for forest plantations and a further 50 square miles are shortly to be allotted. These irrigated plantations cannot replace such large areas of natural forest in all respects, but the much more rapid and dense growth of trees under irrigation may replace past supplies of firewood and timber, and in the times of real scarcity the plantations will supplement the fodder supply.

The most important questions which arise in the plains are whether the proposed area of irrigated plantation is adequate and whether the progress of formation (about 40 square miles to date) is sufficiently rapid. From an agricultural point of view, it seems not merely a matter of replacing former sources of wood supply, but of inducing the large agricultural population of the province to take to burning firewood instead of cattle dung and using the latter to manure their fields.

3 In the hills, the relation between forestry and agriculture is different and more intimate. The soil is often so poor or the climate so rigorous that only inferior field crops can be grown. Rich valleys occur, but new fields are constantly being sought on the very margin of fitness for cultivation, and throughout the Punjab hills agriculturalists are supplementing their returns from agriculture by pastoral pursuits and employment on forest work. New plots of forest land are constantly being brought under the plough, and ordinarily fitness for permanent cultivation and retention of demarcated blocks of forest are the only recognised restrictions.

Generally, the supply of firewood and timber is adequate, and cattle dung, when it is not dropped in the forest, is available for manuring the fields; but fodder crops are seldom grown and in the comparatively small areas reserved for grass it is cut when it has seeded. The population of the hills has been accustomed to rely on the forests for grazing and fodder; the people are entirely ignorant of the number of cattle, sheep or goats the forests can support, and hopelessly unconcerned regarding the quality of live stock they breed. To make matters worse, they grasp any opportunity to convert their own trees into cash, however inadequate the price, they lop to death trees that yield fodder or litter, and they set fire to forests without slightest regard to the fact that they are destroying an important source of their own livelihood. These reckless and destructive customs are resisted or regulated so far as possible by the Forest Department, not only for the good of the people of the locality, but to regulate the drainage of water and prevent erosion, which can have such disastrous effects further afield. The silting up of 200 square miles or more of rich agricultural land at the foot of the Siwalik hills by flood torrents is an historic instance of the results of forest destruction; more recent denudation has resulted from excessive goat browsing in the Kangra hills, and in the Hazara (North-West Frontier Province) Galis forests have been destroyed and erosion started by excessive lopping for buffaloes. Still further afield from the forests, the regular supply of water to the vast irrigation systems of the plains, and the prevention of floods are intimately connected with agriculture and forest protection in the hills. The projected damming of the great rivers to regulate their flow for irrigation purposes will be enormously more costly, if not impracticable, unless forests in the hills are strictly preserved.

4. For these reasons, conservation of the hill forests is of vital importance to agriculture throughout the Province, and the bare enforcement of forest rules, which sufficed when the population was small and the people more simple, is no longer adequate. Pastoral pursuits for trading purposes need to be restricted until the people have learnt to breed better stock, to grow fodder crops and cut hay instead of grass and to stall feed where pasture is insufficient. Apart from this management of the hill forests for the supply of timber needs the closest expert control, not only in the demarcated areas managed by the Forest Department, but where Chiefs of Native States or the villagers have more or less a free hand. Throughout the hills, evidence of destruction or deterioration of forest can be seen where protection is not strict or the population very scanty, and an expert can often detect degradation of vegetation and denudation of soil where worse results are not yet apparent.

Oral Evidence.

45,298. *The Chairman*: Mr. Mayes, you are Chief Conservator of Forests in the Punjab?—That is so.

45,299. I understand you are prepared to be examined upon the note on page 184 of the provincial memorandum, namely, the relation of forestry to agriculture in the Punjab?—Yes.

45,300. Do you regard the area of forest in the Punjab, having regard to its distribution through the Province, as adequate?—No, I do not at all, and especially as regards the distribution; you will see from these figures given here that, roughly, 2,500 square miles of the forests are in the plains and 4,200 square miles are in the hills. The amount in the plains is entirely inadequate, especially in view of the fact that most of it is now going under colonisation.

45,301. Do you regard your department as responsible for representing to Government any inadequacy of that sort?—Yes, certainly.

45,302. Have you done so?—That has been done and is continually being done.

45,303. The remedy, I take it, is planting?—The remedy in the plains is irrigated plantations.

45,304. Would the principal purpose of such irrigated plantations be to provide fuel for the rural population?—Hardly; I would not say entirely the rural population, but the whole population of the Province.

45,305. Fuel or timber?—Fuel and timber; as a matter of fact, the greater part of the timber comes from the hill forests; the plain forests do not provide much timber; they do supply a certain amount of hard wood timber which is necessary for certain purposes; most of the constructional timber comes from the hills.

45,306. Would you contemplate growing constructional timber in irrigated areas?—No, not necessarily.

45,307. So that it is mainly fuel?—It is mainly fuel.

45,308. You point out that, on the Continent of Europe, one acre of forest per head of population is the minimum to make the country self-supporting, and in the Punjab as a whole there may be a quarter of an acre of forest per head of population. I take it that the bad distribution of the forest in relation to population aggravates that shortage?—That is so.

45,309. Are there any schemes afoot for the planting up of irrigated areas?—There are three at present; in the new Nili Bar Colony, that is, the new Sutlej Valley Colony, the Forest Department has been promised three areas of 10,000 acres each. One of those has already been allotted, and the other two are still under discussion as regards their locality.

45,310. Would that area be under perennial irrigation?—The one that has been allotted is not perennial, but it appears that the other two will probably have to be perennial because there is no suitable land left non-perennial.

45,311. How about the requirements of timber in the matter of water?—The forests of Khanewal and Chichawatin are now in course of formation; they have a delta of approximately 4 feet. We only get *kharif* water; we get our water from April to September.

45,312. But year by year all through the years of their growth?—Yes.

45,313. They require as much the first year as they do afterwards?—Yes, in fact they require more at first than they do later. The well-established plantation of Changamanga receives about 2½ feet; that has been established about 60 years now.

45,314. Have you knowledge of efforts that have been made to persuade the rural population to give up the burning of cowdung and take to the use of wood fuel?—I am afraid not; I think that is more in the province of the Agricultural Department as regards the cowdung.

45,315. No doubt, but I thought perhaps the facts have been before you?—The fact has always been before us, but I cannot say that I know of any

special efforts being made beyond the general principle, so to speak, which is more or less enunciated on all possible occasions.

45,316. Do you think it likely that a cultivator who, at any rate, believes that he is getting cowdung cakes for nothing, will give up that practice and pay even a small sum of money for fuel?—I do not think it is very likely until he is educated up to the point of thinking more of the cowdung.

45,317. Have you ever considered an obvious alternative to charging a price for the wood, which would be to finance the growing of firewood by means of a very small cess on land within reach of the timber, and thereafter of giving the wood free of charge?—No, I do not think any such proposal has been made.

45,318. Do you think that would be feasible?—Where would the money come from?

45,319. A small cess on the land?—I presume that would be possible, yes, provided the amount of money was sufficient.

45,320. Or the cess might be payable by the individual. I am concerned to discover whether you have ever thought out the problem from the point of view of meeting this difficulty, which is universal, of persuading the cultivator to pay anything, however small, for his fuel?—No, we have not considered that way of doing it.

45,321. Are you satisfied with the degree of touch between your own and the Agricultural Department?—I have nothing to complain about; I do not know that we are in very intimate touch with the Agricultural Department itself; of course, we are in a very intimate touch with the zamindar in very many parts of the Province. As a matter of fact, I cannot remember our ever having very much to do with the Agricultural Department itself in the course of my service.

45,322. Has it ever occurred to you that it might be useful to have young officers attached for a short period to the Agricultural Department to be posted in districts where agriculture and forestry problems meet?—No, I do not think I have ever felt the want of that.

45,323. Is your department doing anything to plant up ravine heads and ground liable to erosion?—A certain amount is being done in the Pabbi plantations. You mean on the lines of the Cawnpore and Etawah work in the United Provinces? It is not quite so promising in the Punjab as it is in the United Provinces as regards that kind of work.

45,324. Have you problems of erosion?—Yes, we have very serious problems of erosion in the Punjab hills; in the whole of the low hills in the Punjab the erosion is very serious indeed.

45,325. Can your department do anything towards solving that problem?—We do our best to protect the forest growth, which is the best way to prevent erosion. Plantation is both very difficult and very expensive in places of that kind.

45,326. Are you satisfied with what is being done?—I should like to see more done in the matter of protection of forest growth outside the areas which are under the Forest Department.

45,327. Would that protection amount to the prohibition of grazing?—The restriction of grazing.

45,328. That is the main protective measure?—Yes, that is the main measure, particularly with reference to the browsing of goats.

45,329. Have you shifting cultivation?—Not to any appreciable extent.

45,330. That practice is not responsible for the deterioration?—No, there is very little now; there used to be a certain amount, say, twenty or thirty years ago, but there is very little of it now.

Mr. W. Mayes.

45,331. Have the Native States within the boundaries of and adjacent to the Punjab Forest Departments of their own?—Yes, most of the larger States have. Kashmir, of course, has a very large Forest Department; Chamba has a Forest Department of its own, so has Mandi, and the larger of the Simla Hill States have forest staffs.

45,332. Is it within your knowledge that erosion is either taking place or threatening on an important scale in certain of these Hill States?—Yes, in some of them.

45,333. Control is not sufficiently effective?—Control is not sufficiently strict.

45,334. Could you give us any statement showing a comparison between the value of timber which might be grown on canal land and the value of the land for crops?—I can give you figures to show what we expect to get out of an irrigated plantation; we expect to get out of an irrigated plantation a net profit of Rs.25 per acre per annum after paying all expenses; that is the actual figure for the present Changamanga plantation, which is the only one we have in full bearing now; I should add on to that Rs.3 which we pay for water rate, which makes Rs.28 actual return to Government.

45,335. *Professor Gangulee*: After how many years?—This plantation has been going now for 60 years; it is thoroughly well established, but we expect to get that return after the first twenty years.

45,336. *The Chairman*: When do you get your first cuttings?—At the age of fifteen years with a new plantation, and that is afterwards generally raised to twenty; the normal rotation for a plantation is twenty years.

45,337. Broadly speaking, does that mean that no private person is likely to undertake the planting of timber in irrigated areas?—I do not think it is in the least likely.

45,338. But at the same time, provided Government is successful in conducting operations, as you point out, no loss need be incurred after fifteen or twenty years?—After the first fifteen years the plantation is in full bearing and should give about Rs.25 per acre per annum profit. That takes no account of the capital value of the land that remains in our hands.

45,339. *Mr. Calvert*: Or of the compound interest on the capital outlay during the first fifteen years?—No, that has been wiped off by interim revenue.

45,340. *The Chairman*: So that your Rs. 25 per acre per annum is clearly net profit?—That is clearly net profit. I can, as a matter of fact, give you the figures; this is the estimate for a plantation of 10,000 acres; this puts the formation period at twenty years; the total cost of formation will be 6¾ lakhs; the cost of irrigation will be 8½ lakhs; that is 15¼ lakhs. The total interim revenue in those twenty years will be 17¾ lakhs; so that there is a balance on the right side even during the period of formation.

45,341. Is there no plant which will give fuel before fifteen years in this climate?—Not sufficiently large fuel; a plantation begins bearing in the sixth year; it is thinned first in the sixth year, but that produces very small brushwood, suitable, of course, for the purposes of the zamindar but not for other purposes, and we have to think of the other purposes. As I said, these plantations are required for the entire fuel supply of the Province, which includes the towns and the military demands which are very large; for those purposes larger stuff is wanted.

45,342. At what figure do you value grazing rights?—20 lakhs, is it not?—About that.

45,343. On page 683, 20 lakhs a year is shown as the value of the rights to grazing and grass-cutting, and 2 lakhs as grazing and grass-cutting fees where rights have not been admitted?—Yes.

45,344. What is the position there?—That means those forests in which rights have not been admitted under the forest settlement. Every reserved and protected forest has a settlement, in which all rights are recorded. Rights are ordinarily free, but where there are no rights people are allowed to graze their animals on payment of fees.

45,345. So that the 2 lakhs are realised where there are no rights?—Yes.

45,346. *Sir Ganga Ram*: Do these hill people consider the proximity of your department as a means of oppression or of help?—I am afraid they do not like us very much.

45,347. Should not you consider how to make yourselves more popular?—We do our best, but it is uphill work.

45,348. Do you not think your guards are responsible for the trouble?—Very possibly, but I think that is so with the subordinates of all departments.

45,349. The subordinates of other departments have to deal with more intelligent men?—Not necessarily, surely?

45,350. What pay do you give your guards?—Rs. 16, Rs. 18 and Rs. 20. There are three grades.

45,351. Could you not remedy the evil by increasing their pay slightly?—The remedy is being applied now, in the shape of better supervision. We have increased our superior staff in the last few years, and the result has certainly been an improvement in the behaviour of the subordinates.

45,352. Have you any hills on which no trees grow, and have you tried any terracing system there?—We have tried terracing in the Pabbi, and we have also tried a certain amount in the Ambala district, but without success.

45,353. Why?—Because the rainfall there is too heavy; all the trenches are swept away by the first monsoon.

45,354. It depends on the terracing. Was it sloping outside or inside?—I am afraid I cannot tell you, but the rainfall in that part of the world is too heavy for work of that kind.

45,355. In the new forests, do you allow interculture of potatoes or anything like that?—Very seldom.

45,356. Do people not apply for it?—No. Do you mean in the high hills?

45,357. Yes?—They never ask for it. Generally speaking they have as much land as they can look after.

45,358. Do you keep nurseries from which you can supply walnuts for the people?—No. We have orchards for apples, pears and so on from which we supply grafts.

45,359. You do not have walnuts in the high hills?—No.

45,360. They make a very good food and can be exported. People have asked me if they can get small trees for planting?—We have three nurseries for supplying grafts, but not for walnuts. They would not come to us for walnuts, because the jungle walnut is not good to eat.

45,361. *Sir Thomas Middleton*: You point out that, in the Punjab there is only one quarter acre of forest per head, as against an average of 1 acre in European countries. Is your one quarter acre comparable with the one acre you find in those countries?—No, not at all.

45,362. A large part of your forest area is under grass?—Under scrub; not much of it is merely under grass. What is not under timber is mainly

under firewood forest. In Europe, however, it is generally high forest, bearing timber.

45,363. So that your proportion of timber is really very much less than the one quarter acre suggests?—Yes.

45,364. Is there any system of forming plantations in your Canal Colonies?—We are forming them now. We have five under formation at the present moment.

45,365. Are you attempting to form enough to provide one acre per head of the population there?—We have not worked it out to that particular figure. We are attempting to supply the entire requirements of the Punjab, but we have nothing like so large an area as we require for that purpose. 3,000 square miles have been disforested in the past 25 years, and well over 1,000 square miles more are going to be given up for colonies. Those 4,000 square miles are all situated in the plains. Those forests are the ones which used to supply practically all the firewood requirements of the Province: the towns, the military (which is a very large demand) and, to a smaller extent, the agricultural demand. Those have now gone, or are in process of going. We do not see where the supply of fuel is coming from when those have gone, because, of our plantations, there is only one in full bearing now. Five more are in formation, but even when they are in full bearing, they will not be in a position to supply the whole of the demand.

45,366. Are your plantations "plantations" in the strict sense? Are you planting trees?—They are entirely artificial. The trees are sown and planted. They are created out of absolutely bare land.

45,367. Are there any areas enclosed with the object of getting natural regeneration?—Not in the plains.

45,368. That is impossible?—Regeneration is mainly natural in the plains, but it is coppice.

45,369. What are the trees you usually use?—*Shisham* and mulberry in the plains.

45,370. Which are the best trees for withstanding salt in the Punjab?—We are still experimenting with regard to that. We have had a certain amount of success with *shisham*. *Kikar* stands the salt to a certain extent, but suffers badly from frost. We are trying various species of eucalyptus, and some seem to be promising.

45,371. We saw a number of trees on the Ferozepore road yesterday which had apparently died from salt?—There are a number of causes from which trees may die; I would not like to give an opinion as to why they died.

45,372. *Sir James MacKenna*: I understand you have been Director of the Research Institute at Dehra Dun?—For seven months in 1923.

45,373. Were you previously on the staff there?—No, I had never been there before.

45,374. The work there is divided into two branches, research and education?—Yes.

45,375. Are the educational arrangements affected to any great extent by the advanced training of forest staff now given?—All the education side has been altered by putting the Imperial Service officers there for training and abolishing the class for Provincial Service officers. In my time there were classes for the Provincial Service and for Rangers only.

45,376. Was the teaching and research staff distinct in your time?—The teaching staff was distinct, but a certain number of research officers gave lectures on their own work.

45,377. Is the teaching staff more or less permanent?—No, it was not in my time.

45,378. There was a constant inflow of officers from the Provinces to Dehra Dun. Is that on the teaching or the research side?—Both, but more on the teaching side.

45,379. What, as a rule, is the period for which an officer from a Province is recruited for the teaching side? Five years?—I cannot tell you. Some men have been there longer than others.

45,380. I wondered whether you knew the policy with reference to drafting in men from the Provinces to Dehra Dun. They go back to their Provinces as Conservators?—The object is not to allow a man to remain at Dehra Dun so long as to get out of touch with actual forest conditions. He goes back to his Province as Divisional Forest Officer. We want to keep up the touch between the actual forest work and the teaching work as much as possible.

45,381. Do you think that reacts also on the officer and is of considerable help to him when he goes back to his ordinary work?—I would not say that, but the converse is true, that a man who has been a Divisional Forest Officer makes a better instructor than one who has not.

45,382. On the other hand, would I be correct in inferring that there is a more or less fixed research branch? I am thinking of Mr. Pearson, who was there for many years?—Yes.

45,383. Your Entomologist also has been there a long time?—And our Botanist.

45,384. Otherwise, research and teaching are kept up by a constant inflow of selected officers from the Provinces?—Yes, but the research branch is tending to become more permanent, while the teaching staff is not. It is not the policy to make the teaching staff permanent.

45,385. The amount of teaching done by the research staff is limited?—Yes, limited to special lectures on special subjects.

45,386. *Professor Gangulee*: Have you any facilities for forest research here?—No, nothing to speak of.

45,387. Have any steps been taken to stop erosion on hillsides? Have any experiments in that direction been made?—We have done the trenching work Sir Ganga Ram referred to in two places. As I said, it was a failure in one and more or less a success in the other.

45,388. Is that experiment being continued?—Yes, in the place where it has been successful so far.

45,389. Are experiments being carried out in the reclamation of land already seriously eroded?—There is no need for experiment in that direction; we know exactly what we want to do, but the difficulty is to do it. As I said before, the principal thing to do is to restrict the browsing of goats and similar injuries. In the Punjab, if you give nature a chance she will do these things herself.

45,390. With regard to the large area that was silted up as a result of forest destruction, I think a Bill was passed to take possession of this vast area?—No, I do not think it was for that. There was the *Chos** Act, but I cannot tell you many details about that because the Forest Department had nothing to do with it or its working.

45,391. I am concerned to know whether that area has been afforested at all?—No. A few plots where closure to grazing has been effected have been considerably improved, but generally speaking the closure has not been sufficiently effective and not much good has resulted.

* The Punjab Land Preservation (*Chos*) Act, 1900.

45,392. Is it the intention of Government to afforest the whole area?—No. I do not think it is necessary to afforest the whole area. All that is necessary is to prevent the forest growth from being injured.

45,393. You would depend on natural growth?—Yes.

45,394. You say that the villagers set fire to the forest. Have you many cases of that?—Not quite so many as we used to have years ago, but a great many.

45,395. Do they do it deliberately?—Yes, generally in forests on low hills, with the object of improving the grass crop by burning off the old grass and so on. Generally, therefore, we try to burn it ourselves before there is a sufficient accumulation to make the fire very bad. We burn it ourselves every other year.

45,396. On page 684, you say the bare enforcement of the forest rules is no longer adequate. Do you think it is necessary to revise the forest rules?—I do not know what was at the back of my predecessor's mind when he wrote this. It may be necessary to tighten up the rules in some respects.

45,397. Could you say what percentage of the forest area is under the Forest Department and what percentage is under the civil and military control?—There is not much under the military authorities.

45,398. *Mr. Calvert*: What is the explanation for the much larger number of cattle grazing in the Punjab forests as compared with other Provinces?—I do not know, except that practically all the cattle in the neighbourhood do graze in the forests whereas that is not the case, I understand, in any other Province.

45,399. On this question of forest per head of population, the opening paragraph of the note says that there may be one-quarter of an acre per head of population. Does that mean Government notified forest?—It means all kinds of forest, including all the scrub jungle.

45,400. In the Punjab, is practically all the area under your control opened out to grazing or cutting of grass?—Nearly all; only 60 square miles out of 6,700 is not open to grazing or grass cutting.

45,401. Is the fuel available from the Changamanga reserve auctioned?—Yes.

45,402. Is it auctioned so that the rural population may also buy it?—Anyone who wishes to buy it may do so; ordinarily the minimum lot is 1,000 cubic feet.

45,403. What about the smaller branches?—They are left to lie on the ground for anyone who wishes to take them away, free.

45,404. There was a case, was there not, in Kangra, in which as an experiment the forests were taken away from your departmental control with a view to having a more popular management?—Yes.

45,405. What happened?—What happened was that the staff which was employed on these forests was of course employed in the civil department, and after a year's management the Legislative Council refused the vote for that, with the result that the forests were handed back to us.

45,406. Was there any attempt to discover the results of popular control?—Hardly, I should say; I do not know that it was liked any more than the Forest Department control was liked.

45,407. But practically the attempt to hand over certain forests to popular control was killed by the action of the local Council?—Yes.

45,408. *Mr. Roberts*: Could you tell us anything about the attempt to afforest the Hoshiarpur and Umballa Siwaliks?—A certain amount of work was done in the Umballa Siwaliks by way of trenching and sowing.

on the lines of the work done in the neighbourhood of Cawnpore and Etawah and it was all swept away by the first monsoon. Such work cannot be carried on in a country with a heavy rainfall such as we have in the Hoshiarpur Siwaliks.

45,409. Have you any suggestions to make as to how it could be carried out?—I have said before I am in favour of the attempt to leave nature to do it for us by means of closure to grazing and fires. If the areas are closed against grazing and fires, you may be pretty sure that nature will very soon reclothe them with forest growth and stop the erosion.

45,410. Regarding irrigated forests, I think you mentioned, in reply to the President, that they do not pay as well as the crops of the ordinary agricultural land?—I do not think I said that. I gave a figure of Rs.25 or Rs.28 per acre per annum profit; I do not know what the profits on the ordinary agricultural land are.

45,411. Assuming it to be the case that the profits from crops are bigger, would you have any objection to your forests being some distance away from *mandi* towns?—No, I have no objection to that as long as the plantations are given good soil, are sufficiently well commanded, and are alongside the railway.

45,412. You get water only the in summer?—*Kharif* water.

45,413.—Would there be any objection to your going to the upper reaches of the canal?—None, so long as those three essentials are fulfilled.

45,414. Have you any suggestions at all with regard to village woods, that is with reference to the supply of fuel?—They are not as a rule very promising; at any rate, I have never heard of any village forests being a success in the Punjab.

45,415. Your department has not taken up this matter?—No, there are no village forests of that kind in the Punjab. Of course, in countries like France and Germany, there are communal forests which are very well managed and are also very profitable, but the people of this country have hardly advanced in education sufficiently far to be able to manage the forests in that way.

45,416. *Sir Ganga Ram*: Have you tried to grow English oak?—Yes, in Gora Gulli, Dalhousie and other places.

45,417. Why should not the old oaks be replaced altogether?—You mean replace the indigenous oaks by English oaks? That is rather a large order.

45,318. Are you trying it?—No.

45,419. Because you know that all the indigenous oak is being turned into charcoal?—Yes, very largely, but there you come into the question of getting the wood out when you have grown the oak.

45,420 You know that there are three kinds of gum which are exported from all over the country. Do you produce all of them in the Punjab?—No.

45,421. We have been told in evidence by an eminent scientist in the person of Dr. Fowler that all the rank grass can be converted into organic nitrate, into solid organic matter?—But the cattle eat all our grass.

45,422. I am talking particularly of rank grass found on the banks of the canals, that is reed grass?—The Forest Department has not anything like that.

45,423. Would you like to see any research being started in this direction?—Research on that subject is being carried out at Dehra Dun.

45,424. For fertilizers?—I am not sure about fertilizers.

45,425. Do you get good income from myrobalans?—There are none in the Punjab.

45,426. Can you tell me the name of any tree which will not cast an injurious shadow on the crops if you grow it on the edges of fields?—I am afraid I cannot recommend any tree that will not cast any shadow?

45,427. I mean an injurious shadow?—You mean a tree that will only cast a light shadow?

45,428. For instance, under *babul* the crops will not thrive. Can you give me the name of any such tree?—I think the best one would be *Eucalyptus Citriodora*.

45,429. Do you supply railway sleepers?—Yes.

45,430. Do you meet the entire demand?—No.

45,431. How much do you produce?—Only about a lakh a year.

45,431. Have you considered the question of cactus as a food for cattle?—We have no cactus in the forests of the Punjab; there is plenty on the Dalhousie road and other places, but not in the forests.

45,433. Have you any transport arrangements for bringing fuel by small railways?—Yes, we have a tramway at Changamanga.

45,434. I know that, but I want to know about the hills?—No.

45,435. *The Chairman*: Sir James MacKenna asked you one or two questions about Dehra Dun. If and when forestry becomes a provincial subject in all Provinces and a transferred subject as well, do you think it likely that Dehra Dun will retain its position as an All-India Imperial centre?—That is rather a difficult question to answer. I certainly think that it would be difficult for it to maintain such a position.

45,436. Meantime every Forest Officer in India looks to Dehra Dun as the centre of his professional interest?—Yes; I think myself that anything which destroys co-ordination between the Provinces, will react very seriously on Dehra Dun.

(The witness withdrew.)

Mr. W. H. MYLES, M.A., Professor of Economics, Punjab University, and Honorary Secretary, Board of Economic Inquiry, Punjab.

Note on the Board of Economic Inquiry, Punjab.

The Board of Economic Inquiry, Punjab, was instituted as an Official Board in 1919. The Constitution of the Board is given in Appendix A. It was originally contemplated that there should be a Joint Board and two Sections, one dealing with Rural and the other with Urban questions. These three still exist on paper, but the activities of the Board have come to centre almost entirely round the Rural Section.

The President of the Joint Board was not, as far as I can see, legislated for on paper. After Sir John Maynard had acted for a short time, Lala Harkishen Lal, as Minister of Agriculture, was appointed, and on his retirment as Minister he was nominated Chairman by name. He is still nominally President of the Joint Board, though, as a matter of practice, it, as a body, has ceased to function. The Senior Secretary to the Financial Commissioners is Secretary to the Joint Board, and the annual Budget demand of the Board is still submitted through him.

As originally constituted, the Chairman of the Rural Section was the Financial Commissioner (Revenue). The large number of changes which took place in the incumbents of that post from 1920 to 1922 led the Board to approach Government with the request that the Chairman of the Rural Section should be nominated by name and not by office. This request was acceded to, and in 1922 Mr. C. M. King, C.S.I., C.I.E., I.C.S., was, on the recommendation of the Board, appointed Chairman (vice. the Financial

Commissioner, Revenue, *ex officio*). The Section appoints its own Secretary. Mr. J. H. Towle was Secretary of the Rural Section from 1920 to 1922 and was succeeded by Professor W. H. Myles.

The Chairman of the Urban Section is still, as originally contemplated, the Financial Commissioner (Development). The Honourable L. Manohar Lal, the present Minister for Education, acted as Secretary of the Section from 1920 till 1924, when he resigned. The Section elected Professor W. H. Myles to fill the vacancy.

2. The most important change which falls to be noted is the conversion of the Board from an official to a non-official body. This change was made at the instigation of Sir Patrick Fagan. Difficulties arose with the Accountant-General in connection with the payment of bills to non-official investigators. Further it was obvious that no research work worthy of the name could be done on a grant of a few thousand rupees which was voted in April and which lapsed if not spent within the following twelve months. Government was, therefore, approached with the request to make the Board a non-official body and this request was granted in 1922, though it was not till March, 1924, that the Board was able to open its own account with the Imperial Bank of India.

3. The subsequent history of the Board may be briefly told. The Rural Section has forged ahead. From 1922 to the end of 1924, little actual field work could be undertaken because in 1923-24, during the period of acute financial stringency, the grant made by Government was cut down to some Rs.5,000, and the unspent surpluses of the previous years had lapsed. Systematic preparation was, however, made during this time for undertaking a comprehensive scheme of work which was begun as soon as the finances permitted. A questionnaire was drawn up for villages inquiries, and plans made for conducting other work. The results of part of this work have already been published, a considerable portion is now in the press, and investigation is still proceeding. It is our present intention to conduct a village survey in one village in each of the 29 Districts of the Province. Thirteen of these are either in progress at present, or have been completed. A list of work already published, in the press and forthcoming is attached as Appendix B.

By 1922, the Urban Section of the Board had gone quietly to sleep. Attempts to resurrect it since that date have, for various reasons, not met with much success.

The Joint Board during the same period has also ceased to function. The only *raison d'etre* for its existence was to combine the budget demands of the two Sections, and to allot the grant received between the two. With a sleeping Urban Section the need for a Joint Board practically disappeared and in practice its functions have been largely taken over by the Rural Section.

4. In some respects the original arrangement, as modified by Government's letter declaring the Board a non-official body has been eminently satisfactory. There is an advantage in economic investigation being conducted by a non-official body not out to prove the existing system of administration the best that human brains can devise—a challenge which, rightly or wrongly, would undoubtedly be levelled against the work of an official body—yet safeguarded by the fact that the Board contains a number of officials ready to cry "hands off!" when anything sacred to the heart of the official is challenged. From the standpoint of its field work I personally feel—though there is a difference of opinion on this point—that the non-official investigator, though, to begin with, he may be less well-informed than the investigator borrowed from some Government Department, has many advantages and in the village is most likely to get nearer the truth. It is possible, also, to organise a systematic programme of work with even small grants if there is no fear of their lapsing when not spent by the end of the financial year. The finance has been

simplified, and it has been found possible to employ non-official investigators and pay their bills without securing Government authority for each disbursement—Government being, of course, safeguarded by the account of the Board being annually submitted to it after scrutiny by a certified auditor. Further, the fact of the Board being non-official may have enabled it in the past to procure services gratis which it might not otherwise have done, e.g., those of the Honorary Secretary and those of Members-in-Charge of investigations

5. At this stage it may be convenient to sketch the procedure adopted by the Board in the conduct of its inquiries. When work on any problem is contemplated it has grown to be our practice to refer the matter to a Sub-Committee for report. If their opinion is in favour of an inquiry being undertaken, they are entrusted with the task of putting forward a workable scheme, if possible in the form of a questionnaire. Not till this has been done is an investigator appointed. It has been our practice in the past to advertise for investigators, though, at the moment, we are trying the experiment of borrowing a man on deputation from the Revenue Department or the Agricultural Department of Government. On the advisability of this latter move there is a distinct difference of opinion within the Board. The minimum qualification for an investigator is that he has taken his B.A., though M.A.'s and B.Sc.'s in Agriculture are preferred. The investigator is set to work under a Member-in-Charge, who supervises his work and is expected to put the report into a form fit for typing for circulation to members. Before the report is passed for publication, the suggestions and criticisms of members are considered, preferably by a Sub-Committee, the recommendations of which are then considered by the Board. No claim is made that this is a perfect system—in fact it entails a considerable amount of work on the part of members—but experience has shown that it does admit of getting the work done under adequate safeguards, and so has been adopted. The procedure has two disadvantages: (*a*) that the investigator is generally an untrained man; and (*b*) that it throws more on the members of the Board than the Board perhaps has a right to expect. Each of these will be referred to more fully later. What should not be lost sight of, however, in any re-organisation of the Board is that so far the method has worked. The man who is in many ways most competent to make real contributions to our economic knowledge of the Province is the official getting on in his service and there is a tremendous advantage in much of our work enjoying the advantage of his supervision with all his accumulated experience. No one can read, for example, our Amritsar village survey which was supervised—re-written as it happened—by Mr. King without recognising what a report of this nature gains as a result of the investigator working under a man with a first-hand knowledge of the District. At the same time one of the problems of the Board in future must be to stimulate the interest of the public in its work. This is not an easy task and up to date the bulwark of the Board when there has been actual work to be done—I do not here refer to attending meetings and talking—has been, with one or two exceptions, the official.

6. Up to the present, the Board has been solely dependent on Government for its funds. The Government of the Punjab has, except in the particularly bad year 1923-24, been generous in its response. A Statement showing the annual grants made by Government since 1920-21, and the annual expenditure of the Board since that date, is attached as Appendix C. The "Income and Expenditure" statement of the Rural Section of the Board for last year is attached as Appendix D. It should be particularly noted that the bulk of the expenditure falls under the Headings "Salaries" and "T.A." to Investigators and "Printing," and that the overhead charges are extremely small. This is accounted for by the fact that the Secretary has given his services gratis, and the office staff has been kept

down to a minimum. When the Board is put on a more stable footing, an increase in these overhead charges must be contemplated.

7. This brings us to review the existing position. In the Punjab, there has been laid by the efforts of a few individuals the foundation for a Bureau of Economic Research. The work already published is claiming attention not only in India but also abroad. It has largely been a labour of love. No one who has had any connection with the Board would like to see its activities curtailed; on the other hand, the work already done is making more clear to the members the still larger field that remains to be explored. I note that the Oxford Institute of Rural Economics is publishing village economic surveys similar to those on which the Board has been engaged since 1925, and the published results of which will be forthcoming shortly. If work of this nature is necessary in England where so much systematic study has already been undertaken, how much more necessary is it in the Punjab if a sound agrarian policy is to be formulated? A certain amount of research work along the same lines as we are following here is perhaps being done in other Provinces, but where we lead is that in the Punjab we have in hand an *organised* scheme of research. The Board is a *co-operative* effort on the part of those who know most about, and are most interested in, the economic problems of the Province. Other Provinces are beginning to recognise the necessity of undertaking similar systematic investigations. Within the last month, I have had communications from the Revenue Member of the United Provinces and from the Secretary of the Provincial Co-operative Institute, Bombay, asking for all details about our Constitution and our work here.

The Punjab in this respect is simply keeping abreast of other countries. It is coming to be more clearly recognised by all Governments that the formulation of an economic policy is dependent upon accurate data being available, and it seems to me that a Board, the aim of which is to investigate the facts of the economic situation deserves every encouragement. What should not be lost sight of, however, is that work of this nature must be carried on steadily from year to year; the field will yield little to sudden bursts of energy and then relaxation.

The Punjab Government would appear to be realising more the advantages of such a body During the controversy over the Punjab Money Lenders' Bill, the Board was asked to collect figures in the villages under investigation showing the money outstanding to agriculturist moneylenders, non-agriculturist moneylenders, &c., and a Report was submitted to Government. Recent references to the Board from Government include such things as the percentage lost by buyers through faulty weights and measures, the extent to which the big agriculturist is swallowing up the small, &c.

8. The question of the re-organisation of the Board is at present under consideration. The principal defects which experience has shown to exist are:—

(*a*) The untrained investigator. It has been the practice of the Board to employ an investigator for one year on Rs.150 p.m., i.e., for one village survey. To begin with the Board was opposed to employing an investigator, even one who had done well, a second time, in case he imagined that he thereby acquired a right to employment in some other department of Government. This system had the great disadvantage that the experience gained in conducting one investigation was thrown away, and recently two investigators have been appointed for a second inquiry. Even this hardly meets the case. For work of this nature we require the best type of graduate, and while Government Service retains its present lure for them we are not likely to get the best men on any short term contract. Work under the Board tends to be regarded as a backwater where a man may be stranded when Government jobs are passing by.

The rectification of this trouble is dependent on the Board being assured of its annual grant, or the institution of a capital fund. A suggestion that has been made is that the Board's investigators might be put on one or other of the Government's cadre, e.g., that of the Co-operative Department. If the Board could receive an assurance from Government that it might safely depend on an annual grant of a certain amount for, say, the next ten years, it would be possible to make more permanent arrangements, e.g., a graded scale, say, Rs.150 to Rs.350 p.m., and the establishment of a Provident Fund in lieu of pension.

(*b*) Practically the same position exists as regards the Headquarters Staff. When I took over the post of Secretary, at first, I carried on for over a year with no clerical assistance. A clerk was then appointed on Rs.100 p.m. (now Assistant Secretary on Rs.150 p.m.), and about a year ago a typist was added on Rs.60 p.m. As at present constituted the Board has no prospects to offer them, and the result is that the Assistant Secretary is now a selected candidate for employment as an Income Tax Officer and the typist is at present sitting the examination of the Staff Selection Board in Delhi. Assuming they went off together it would be extremely difficult for an Honorary Secretary to carry on. As regards the post of Assistant Secretary it would pay the Board to make it one which a man could take up as his life-work, but this again is dependent on the assurance of an annual grant.

(*c*) The existing methods of conducting work throw perhaps more on the members than the Board has a right to expect. This applies particularly to those who are acting as Members-in-Charge of investigation. The employment of the untrained investigation throws on them much work of a somewhat routine nature of which they might well be relieved. In some cases, it has been necessary for the Member-in-Charge to re-write the report—so weak was the investigator's knowledge of English. If investigators are taken on permanently, this difficulty would be partly overcome, for the investigator as such would know more about his work; and it might later be possible to promote a good investigator to the post of inspector of work in progress. This would relieve the Members of much work they are doing at present and leave them freer to devote their time to broader questions, e.g., the initiation of new inquiries and the consideration of the way in which this work should be tackled.

(*d*) The Board cannot contemplate the general work of direction being carried on for ever by an Honorary Secretary—in fact, if I had to give up the work to-morrow, I fear there might be trouble in finding someone to carry on. This is perhaps the weakest link in the present organisation. Possible alternatives are:—

(i) Putting the Board under one of the existing departments of Government, e.g., Land Records or Co-operation, in which case the work of supervision might be carried on by the head of that Department. This would mean sacrificing to some extent the non-official nature of the Board, and would lead to weakening of the co-operative effort, which should be retained if at all possible.

(ii) Appointing a full-time Secretary. The difficulty here would be to get the proper man. He must in the first place be a trained man, and in the second he must have local knowledge. If a full-time man were appointed the tendency would be to leave everything to him—he would come more and more to be responsible both for the initiation and the supervision of inquiries. I rather fear that what you would have to pay for the man you want would preclude this solution.

(iii) Strengthening the office staff and carrying on by a par time Secretary, not necessarily honorary as at present. If th is the solution adopted, it must be realised that the limit expansion has pretty nearly been reached. The Board has present six inquiries in hand, three reports in the Press ar seven in preparation, and three inquiries along entirely new lin under consideration.

APPENDIX "A."

CONSTITUTION OF THE BOARD OF ECONOMIC INQUIRY, PUNJAB.

Ex officio.

2 Financial Commissioners (Chairmen of the two branches of the Board, Mr. King being Chairman, by name, of the Rural, and the Financial Commissioner, Development, *ex officio*, being Chairman of Urban Section).
1 Director of Agriculture.
1 Registrar, Co-operative Societies, Punjab.
1 Director of Public Health, Punjab.
1 Professor of Agriculture (Punjab Agricultural College, Lyallpur).
1 Inspector of Factories, Punjab.
1 Director of Industries, Punjab.
1 The Professor (or Professors) of Economics in the University of the Punjab.

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Nominated.

2 Officials interested in economics and statistics to be nominated by the Chairmen.
2 Nominees of the Director of Public Instruction, Punjab.
1 Officer of the Co-operative Societies, to be nominated by the Registrar.
4 Nominees of the Syndicate of the University.
1 Indian Journalist to be nominated by Government.
6 Other gentlemen or ladies to be nominated by Government.

16

25 Grand Total.

APPENDIX "B."

PUBLICATIONS OF THE BOARD OF ECONOMIC INQUIRY, PUNJAB.

1. "An Economic Survey of Bairampur in the Hoshiarpur District," b Ram Lal Bhalla, M.A.
2. "The Milk Supply of Lahore in 1921," by Pt. Shiva Datta, M.A.
3. "Questionnaire for Economic Inquiries."
4. "The Size and Distribution of Agricultural Holdings in the Punjab, by H. Calvert, B.Sc., C.I.E., I.C.S.
5. "An Inquiry into Mortgages of Agricultural Land in the Kot Kapur Utar Assessment Circle of the Ferozepur District of the Punjab, by S. Balwant Singh, B.A., edited by H. Calvert, I.C.S.

Mr. W. H. Myles.

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6. "Rates of Food Consumption of Zamindars in the Tallagang Tehsil of of the Attock District," by C. B. Barry, M.A., I.C.S.
7. "Sixty Years of Punjab Food Prices, 1861-1920," By W. H. Myles, M.A.
8. "The Economic Value of Goats in the Punjab," by H. R. Stewart, I.A.S.
9. "An Economic Survey in the Kangra District," by Mul Raj, M.A., edited by H. Calvert, I.C.S. (In preparation.)
10. "Catalogue of Economic Literature in Lahore Libraries," by Cyril P. K. Fazal, M.A. (In preparation.)
11. "Cultivators' Holdings in the Punjab," by H. Calvert, B.Sc., C.I.E., I.C.S. (In preparation.)
12. "Some Aspects of Batai Cultivation in the Lyallpur District," by Professor H. R. Stewart, I.A.S.
13. "Eighty Years of Punjab Food Prices, 1841-1920," by Professor Brij Narain, M.A.
14. "An Inquiry into Mortgages of Agricultural Land in the Pothwar Assessment Circle of the Rawalpindi District in the Punjab," by Raja Hassan Akhtar, B.A., edited by H. Calvert, I.C.S.
15. "Further Accounts of Different Systems of Farming in the Canal Colonies of the Punjab," by H. R. Stewart, I.A.S., and S. Kartar Singh, B.Sc., L.Ag. (In press.)
16. "An Economic Inquiry of Gaggar Bhana in the Amritsar District of the Punjab," by S. Gian Singh, B.Sc., edited by C. M. King, C.S.I., C.I.E., I.C.S. (In press.)
17. "An Economic Inquiry of Gijhi in the Rohtak District of the Punjab," by Raj Narain, M.A., edited by Professor Brij Narain, M.A. (In press.)
18. "An Economic Inquiry of Tehong in the Jullundur District of the Punjab," by Anchal Dass Kandola, B.A., edited by H. Calvert, I.C.S.

FORTHCOMING.

General Economic Inquiries in Rawalpindi, Sailkot, Hissar, Multan, Lahore, etc., etc.

1. "Family Budgets of Low Paid Clerks," by Mrs. Caleb (Urban Section Publication).

APPENDIX C.

Grants and Expenditures of the Board of Economic Inquiry, Punjab, from 1920-21.

Year.		Annual Grant.	Opening Balance.	Expenditure.	Balance in hand at end of year.
		Rs.	Rs.	Rs.	Rs.
1920-21	...	15,000	—	4,665	10,335 (lapsed).
1921-22	...	20,000	—	7,025	12,975 (lapsed).
1922-23	...	20,400	—	3,964	16,436 (lapsed)
1923-24	...	5,400 1,865/13/11	—	5,461/2/11	1,804/11
1924-25	...	10,000	12,204/11	5,646/1	6,558/10
1925-26	...	27,000/3,000	36,558/10	20,869/-/1	15,689/9/11
1926-27	...	66,000	81,689/9/11	—	—

APPENDIX D.

INCOME AND EXPENDITURE STATEMENT FOR YEAR ENDING 31ST MARCH, 1926, OF RURAL SECTION OF THE BOARD OF ECONOMIC INQUIRY, PUNJAB.

Receipts.

	Rs.	a.	p.	Rs.	a.	p.
1. Stamps in hand	3	8	6			
2. Petty cash in hand	14	14	11			
3. Balance b.f. from last year ...	5,588	13	7			
				5,607	5	0
4. Grant allotted by Joint Board for 1925-26 ...				20,000	0	0
5. Special grant from Government				3,000	0	0
Total				28,607	5	0

Expenditure.

	Rs.	a.	p.	Rs.	a.	p.
A. *Salaries*—						
1. Office	661	15	6			
2. Investigators	14,559	13	11			
				15,221	13	5
B. *Travelling Allowance*—						
1. Members	208	7	0			
2. Investigators	950	14	3			
				1,159	5	3
C. *Contingent Expenditure*—						
Investigators			...	240	2	3
D. *Printing*—						
1. Publications...	1,964	6	9			
2. Proceedings	56	4	0			
3. Miscellaneous	275	14	0			
				2,296	8	9
E. *Stationery*	...		...	109	9	0
F. *Advertisement*	...		...	401	4	0
G. *M.O. Commission*	...		...	136	0	0
H. *Stamps*—						
Used	217	2	0			
In hand	31	6	6			
				248	8	6
I. *Miscellaneous*—						
1. Daily contingencies ...	44	0	0			
2. Economic catalogue ...	12	6	0			
3. Furniture	6	8	0			
4. Books	96	12	0			
5. Bank charges	3	2	0			
				162	12	0
J. Audit charges	...		...	25	0	0
				20,000	15	2
Petty cash in hand	...		...	73	6	8
Balance in bank	...		...	8,532	15	2
Total				28,607	5	0

45,437. *The Chairman*: Mr. Myles, you are a Professor in the University of the Punjab?—Yes, University Professor of Economics.

45,438. You are here to-day more especially in your capacity of Honorary Secretary to the Board of Economic Inquiry in the Punjab?—Yes.

45,439. We have asked you to appear before the Commission at very short notice, and in spite of that fact you have given us a note for which we are obliged to you. I think that note explains the position of the Board and your views in certain directions. There are, however, one or two questions I should like to ask you. Do you think the present arrangements by which the Board is financed provide a sufficient degree of continuity and security for the future?—That is doubtful; one of the difficulties is the question of permanent investigators, and we cannot take on permanent investigators unless we are more or less assured of a certain annual grant for a definite number of years.

45,440. You mean a particular inquiry may be estimated to take five years and you are not in a position to engage a man to apply himself to that piece of work for five years?—Not altogether that; the point is that an investigator in doing one survey gains a large amount of experience which is useful for further work; but we take him on for one survey only to begin with, and we cannot keep him permanently as things stand.

45,441. Would you give us the existing constitution of the Board?—That is given in Appendix A. (See page 698.)

45,442. Under the existing arrangements who initiates the research?—The Board itself, or it may be an individual puts up a proposal, or again it may be the Government puts up a proposal.

45,443. To what extent is it really true to say that the Board is a non-official body?—It is non-official in the sense that once the Council has passed the grant for a particular year, the grant is handed over to the Board and the Board has full powers in the spending of that sum.

45,444. Was the main purpose in making the change which you describe on page 694, that is to say, making the Board entirely non-official to secure a non-lapsing grant?—That was one thing which was most necessary. But there was another, namely, the trouble with the Accountant-General in getting the bills of non-official investigators passed; all kinds of difficulties were raised, and it was on that score that the case was put up to Government for making the Board a non-official body.

45,445. Are there any signs that the urban section, which is now according to your own showing asleep, will wake up?—I have an idea that the best method would be to throw the two sections together instead of trying to separate them as they are at the moment. At present I fear the urban section is doing practically nothing.

45,446. Is it doing any harm?—I do not know; the urban section came into being partly owing to political reasons; it was felt that many of the investigators available were better suited for urban than for rural research and that there might be greater support for the Board if it were also looking into urban as well as rural questions.

45,447. Have you got a sufficient arrangement for making preserving and rendering readily available your records of research?—The [illegible] passed by the Board are published and are available to the [illegible] printers.

45,448. *Mr. Calvert*: The material is also available [illegible] Yes, the material is kept and is also available to other investigators.

J.2.N27.E

INDIA OFFICE LIBRARY & RECORDS
No. ...

45,449. *The Chairman*: Are you as a Board receiving the publications on subjects germane to your own activities from abroad?—We get a certain number in exchange, but not a great number.

45,450. Is that a direction in which development might with advantage take place?—I think it is, but it involves expense and such money as we have got up to date I have been rather inclined to spend on investigation and printing our own work rather than in purchasing the work of others; but it is certainly a direction in which we might spend a certain amount.

45,451. Is there a strong economic school in the University?—Not particularly.

45,452. Have you a good economic library in the University?—Fair.

45,453. *Professor Gangulee*: Have you a Department of Economics?—Yes.

45,454. *The Chairman*: It is not a strong school?—I am the one University teacher, and a certain amount of assistance from the Professors in the colleges is got so far as M.A. teaching is concerned; but we are very much under-staffed as things are at present.

45,455. Do you take in a wide range of publications?—Fair; the University library takes in most of the economic journals; they are available.

45,456. So that they are available to the Board?—Yes.

45,457. I should have thought that a rather more definite arrangement for directing the inquiries of the Board was required; how large is your Board? Is it 12?—We have got 25 members, but not all of those are on the rural section.

45,458. How many are on the rural section?—We have about half of those.

45,459. That is 12; do not you think 12 is rather a large body for settling the lines of research that you are going to undertake?—We work to a fair extent by sub-committees of the Board.

45,460. I expect you really do the whole thing yourself, though you will not tell us so?—One gets a good share of it to do, but the one thing in regard to which the members of the Board come in extraordinarily useful is that, when investigations are set going in different parts of the Province, we invariably get one who is familiar with that area and knows it well to act as member in charge, and that is most useful.

45,461. Are you engaging persons to carry on your research work as whole-time servants of the Board itself?—Yes, for one year or for the period of a survey.

45,462. The Board is the employing body?—Yes.

45,463. *Professor Gangulee*: Only for one year?—For one survey so far.

45,464. One survey may take two years?—One actual survey in Kangra district, where we are tackling a very wide area, took over two years; but normally the investigators are employed for one year, which we consider sufficient for the survey of one village.

45,465. *The Chairman*: I observe from your note that you do not think it likely that any salary that the Board could pay to a whole-time paid secretary would be likely to attract the right type of man; is that so?—I think if you appointed a full-time man, more and more of the work would simply be left to him; he would not get the advice and the guidance that an honorary man does, and if you are going to put the whole of the work into his hands, I think you want a first rate man.

45,466. Do you think the Board could afford to pay for a first rate man?—I do not think so; not at present

45,467. Do you see a great deal of work ahead of the Board?—Yes, I see much more now than I did when it started.

45,468. On the whole, are you satisfied with the investigators whom you have employed?—No; and we shall not get the right type of investigator until such time as we can offer them a longer term of contract.

45,469. What do you suggest would be a reasonable appointment?—I think if we could take them on in the first place, say, for five years.

45,470. A five year appointment?—Yes, with some hopes of continuance after that. The difficulty is that a young man wants if possible to get into Government service; if we offer him five years, then he would be too old for getting into Government service by the time those five years had elapsed; if it were only to be five years, I should think he would think twice before he took service under the Board.

45,471. *Sir Ganga Ram*: Would he be any good in any sphere of life after the five years?—He would know a great deal about village economy.

45,472. Knowing is one thing, but what practical good could he do? What service could he come into?—I should think he would be very useful, say in the Co-operative Department, but I speak subject to correction by Mr. Calvert.

45,473. *Sir James MacKenna*: How many students of economics have you?—In the M.A. class at present I have some 28 students; that is including two years, the 5th and 6th year class.

45,474. How many in the other class?—The B.A. is taught in colleges affiliated to the University; they run to about a thousand per year in economics I think.

45,475. How many students of economics were there in Edinburgh when you were there?—In the last year I was at Edinburgh, that was 1919-20, the class ran, as far as I remember, to about 420; but that was a very exceptional year in that officers and men had come back from the War In pre-war days our economics class, which was one of the biggest classes in the University, used to run to 220 to 250.

45,476. When I was at Edinburgh 38 years ago it was about 40. Why do you think there has been this enormous desire to study economics both in Edinburgh and in the Punjab?—In Edinburgh it was said that it was a fairly easy subject to get through; the same is said in the Punjab; but I think there are other reasons as well. It is a subject that is more in the public eye than it was 40 years ago.

45,477. Of course, in my time it was not a subject for the M.A. at all. Do you think the existence of this Board stimulates any desire to do original work amongst your M.A. students?—There is one way in which I am endeavouring to stimulate it amongst the students themselves. It is really with two objects. They have to do a thesis for their M.A. examination, and we have prescribed certain portions of our questionnaire for rural enquiries as a subject that a student may take up for his M.A. thesis; I think that is very good for the students themselves, and also good for us in that we see the students who can collect data and put things together and who might make good investigators with the Board after they have completed their M.A.

45,478. Would you say generally that apart from the degree value of economics it is a good sign that an increasing interest is being taken in the subject in the Universities?—Yes, I think it is a very good sign, and particularly so in India.

45,479. *Professor Gangulee*: Why do you think that such a Board of Economic Enquiry would work satisfactorily if it were a non-official body?—I think from the standpoint of its results there is an advantage

of statistics, and that this work should be under the Agricultural Department?—I do not remember that in his minority report. He divided inquiries into two types, extensive and intensive. Extensive inquiries he thought might be done through the Land Revenue staff, but he recommended that intensive inquiries should be done by something similar to the Board of Economic Inquiry in the Punjab.

45,503. That is the main feature of his report, but he also says that steps should be taken gradually to transfer this work from the Provincial Revenue Department to the Provincial Agricultural Department?—On that I am not prepared to express an opinion.

45,504. Do you think the present agency with the Government of India, the Department of Statistics, is wide enough for the collection of statistics in India?—I would prefer not to answer that question.

45,505. *Mr. Roberts*: Do you think the Board would be capable later of undertaking an inquiry into the economics of cattle-breeding and subjects of that kind?—I should think that is a problem the Board might very well take up. I see no reason why it should not take it up now.

45,506. I have been struck with the difficulty of getting any definite information on the point. It seems to me it might be one of the things the Board might take up?—If you will give us a note on this I will have it put before the Board and discussed.

45,507. *Sir Ganga Ram*: Why is it that 90 per cent. of the students who go in for the B.A. take your subject?—I suppose it is a popular subject.

45,508. As leading to what career?—I do not know, but the students believe it is a good subject. A B.A. in this University has to take three subjects. If he puts in an application for a job, he says, "I took Economics in my B.A." He seldom mentions the other two subjects; he seems to think it is Economics that will get him the job.

45,509. Do not you know he is always looked on with contempt by the people he applies to when he says that?—The student does not believe so.

45,510. Can you give me the name of any of your students who have made good in their after-careers?—Yes. One is now in the European grade of the Imperial Bank of India in Bombay; another is in the officer grade of the Police Department; another went into the Finance and Audit Department, and there are many more.

45,511. But why do they prefer this subject? Is it the line of least resistance?—I cannot tell you the reason why so many take it. It has been said that it is an easy subject, but when I have acted as examiner I have tried to stiffen up the standard.

45,512. What branches of economics do you teach? I have seen your question papers; one question relates to exchange, another to gold bullion and so on. How can you create any permanent impression on them? You give them a degree, and they think it is culture. What practical good is it doing?—The practical good of economics? That is a big question.

45,513. *Sir Thomas Middleton*: You make a strong point of the idea that the Board should be non-official?—Yes.

45,514. Using such official assistance as can be got? That is what you are now doing. You have a number of officials who are assisting you in their private capacity?—Yes. My hope is that in future we will get more assistance from the non-officials, but, so far, with one or two exceptions, we have had to rely largely on the official, when there was actual work to be done.

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45,515. Should not work of this sort centre round the University? In reply to Professor Gangulee, you said you thought it would not be desirable that inquiries of this description should centre round the University, but, to refer to a parallel case, the Institute of Economics at Oxford is a University institution?—Yes, but the running of Oxford University and of the Punjab University are somewhat different.

45,516. A subject which is found to be a suitable one for incorporation in the University of Oxford might presumably be suitable for the University of the Punjab?—I am not saying it is unsuitable, but I think the present machinery is better than you could create at present within the University for the conduct of such work. I give that as my firm opinion.

45,517. Your main difficulty is that you have to employ temporary, untrained assistants, and you have no means of providing a career for these men, so that directly they become useful they leave you?—Yes.

45,518. In order to secure continuity, you want something in the nature of an Institute of Economics, do you not?

45,519. That would enable you to employ a nucleus staff permanently?—Yes.

45,520. At Oxford, there is a small permanent staff, and these village inquiries to which you refer in your note were in fact undertaken by temporary assistants working in conjunction with the permanent staff. If you had something in the form of a nucleus staff here in Lahore could you not conduct many of the inquiries, which are necessary, by means of temporary assistants acting under guidance?—I do not think that would be as successful as if you had permanent men, men who had done two or three investigations. I think the training they will get in doing that will be most valuable in future work.

45,521. If you had a permanent staff attached to the University, presumably they would, in the first instance, undertake such inquiries as they could. The work would grow rapidly, and you could not expect to provide a permanent staff for all the work that might be required in a Province the size of the Punjab; you must have recourse to temporary assistants. I ask you whether the form of organisation which has been adopted in Oxford would not be likely to suit you here?—I think we are better as we are.

45,522. Is there no chance of some Rockefeller or Carnegie coming forward to help you with an Institute of Economics?—I thought of approaching some of the benevolent gentlemen in the Province, but the Board ruled it should not be done.

(The witness withdrew.)

The Commission then adjourned till 2 p.m. on Thursday, 10th March, 1927, at Lyallpur.

in the work being put out by a non-official body, in that if it were done by the Government there would be a tendency, rightly or wrongly, to regard it as proving some foregone conclusion.

45,480. It is purely psychological?—Partly.

45,481. Could you tell the Commission whether the value of the work of the Board of Enquiry is appreciated by the non-officials, the politicians and other educated men of the Province?—It is beginning to be. I remember when we asked for a larger grant, I personally approached some Members of our Council, just to see how the land lay, and I found that it was known to quite a number of them, and they were quite interested in the work we were doing.

45,482. At the present time you depend solely on the Government for financial support?—We do.

45,483. Have you any funds from any non-official source?—We have had nothing of that nature so far. Two years ago I raised the question on the Board as to whether we might bring the Board before the public in the hope of raising funds; the Board at that time decided that no steps in that direction should be taken.

45,484. As you admit yourself in this note, the investigators whom you appoint are not fully trained to carry on investigations?—In most cases they have had no training in research whatsoever.

45,485. So that you appoint them and then direct them to carry on the particular work that you select for them?—What we do is, we draw out very very clearly and definitely the work that they are actually to do. Before I came here there had been certain investigations attempted, but they resulted in nothing successful, because what they did was, they appointed a man and said: "Go and investigate factory conditions." I think that is simply a waste of money. If you take a student who has just completed his course and you want satisfactory work from him, you have got to tell him very definitely the work you want him to do, and see that his work is carefully supervised.

45,486. So, he does it mechanically: he is given a table and he simply fills up the table?—He is there to collect the data.

45,487. If you take an untrained man, about six months may have to be occupied in teaching him the methods of collecting data, and developing his economic sense; do you think such a procedure profitable?—In any case, if you send a man to a village, he has got to be there a certain time before he gains the confidence of the villagers; that is an important point, that a certain time has to be spent more or less in acquiring the confidence of the villagers; but even so, time is wasted through the untrained investigator; I admit that readily.

45,488. I see that most of your reports are written by the officials, are they not?—Most of them have been supervised by officials; there may be one or two that have not been.

45,489. Written by the officials or put in order by the officials?—Put in order by the officials, yes.

45,490. You have made a reference in your notes to the Oxford Institute of Rural Economics; what step would you take for developing this Board of Economic Enquiry into such an institute?—I am afraid I cannot answer that question; I really do not know enough about the Oxford Institute; it has come into the forefront since I saw Oxford last.

45,491. Would you like to see this Board of Economic Enquiry attached to the University as a Department of Rural Economics?—I think it is better as it is.

45,492. Would you like to see it in any way attached to the Lyallpur Agricultural College?—It is very much better with its headquarters at Lahore.

45,493. At the present time I understand it has nothing to do with the Agricultural College at Lyallpur?—No.

45,494. *Mr. Calvert*: I has been suggested that interest in agricultural problems might be stimulated if Rural Economics were made a subject of a degree course. Do you think we are in a position to have a course for a degree in Rural Economics?—I may call Mr. Calvert's attention to the fact that in designing a new course here for the Combined Honours Class, which is a somewhat comprehensive scheme, we made the major course one in Agricultural Economics.

45,495. There are no actual Professors of Agricultural Economics in the Punjab, are there?—There are no Professors, as such, of Agricultural Economics.

45,496. *Mr. Kamat*: In your economic enquiries is it possible to collect the family budgets in rural areas?—That is what our investigators have found one of the most difficult questions of all. In our questionnaire we have one section which deals with consumption, and one investigator after another has told me it is the most difficult section in the whole questionnaire.

45,497. In view of this difficulty, how do you formulate your conclusions with regard to the standard of living in rural areas? I refer to the accuracy of your estimates of such matters?—In view of the difficulty of this question of consumption, we have tried to tackle it in another way. Mr. Roberts, who is a co-opted member of your Commission, has at Khanewal a large number of tenants to whom he supplies grain at rates below the market rates, with the result that his tenants invariably buy grain from him. He very kindly agreed to put the data so collected at our disposal, and the Board appointed an investigator with Mr. Roberts for three months to go into the question of the consumption of food-grains of Mr. Roberts' own tenants, because there the data are more reliable than we are likely to get in a village. That inquiry is proceeding at the present time. All the sections of the reports that have come in dealing with consumption are inclined to be a little weak.

45,498. In view of the fact that this is at best an indirect method of deducing conclusions, could we take it that, after all any conclusions regarding the standard of living are to be taken only as general and not as very accurate?—I think you must, at present.

45,499. That weakens the whole thing?—Yes.

45,500. Should the Revenue or the Agricultural Department be the agency for crop estimates or censuses of production?—That is a point with which I am not directly concerned, and I have not given it sufficient thought to say.

45,501. I thought, as the secretary of this Board of Economic Inquiry, probably this would be a point on which you could give us some enlightenment from your experience. You have not given any thought to this question?—I do know something about it, as I was on a statistical committee which met here and made certain recommendations on crop estimates, price statistics and various other things, but it is not really in connection with that that I have come before you to-day.

45,502. I believe the Report of the Economic Inquiry Committee referred to this point, and Professor Burnett-Hurst was inclined to take the view that the Revenue Department was not the correct agency for the collection

Thursday, March 10th, 1927.

LYALLPUR.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*).

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, KT., C.I.E., M.V.O.
Sir JAMES MACKENNA, KT., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Raja SRI KRISHNA CHANDRA GAJAPATI NARAYANA DEO OF PARLAKIMEDI.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc. } (*Co-opted Members*).

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH. } (*Joint Secretaries*).

Mr. T. A. MILLER BROWNLIE, C.E., M.I.W.E., M.I.M. & C.E., Agricultural Engineer to Government, Punjab, and Principal Agricultural College, Lyallpur.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(*a*) When an officer is appointed in order to carry out a particular line or lines of research it is essential that he should be provided with the necessary staff to assist him to carry out his ideas; particularly is this the case after he has performed several years of work in the Department and when it would be a waste of his time for him to perform the many matters of routine which the investigations entail and which would be more economically performed by a trained young assistant working under his guidance, thus leaving the specialists with more time to devote to other lines of investigation.

Such an increase of staff necessarily means additional cost in the working of the particular research section, and as research cannot be run on commercial lines, it requires to be financed by Government, but the results of such research may prove of great financial benefit to the Province. That such research has proved of benefit to the province is, I think, evident from the fact that the budget allotment to the Punjab Agricultural Department has risen from 2½ lakhs in 1906 to 38½ lakhs in 1926. Certain lines of research are of All-India importance and might be more economically carried out under the direction of a central authority.

(*b*) In the Engineering Section of the Department progress during the past five years has been very seriously hampered for the want of trained Assistants. Most of the agricultural implements in use in India at the present time leave very great room for improvement, and there is a vast field of work in this line alone. Take, for example, the plough. Several types of modern ploughs are in use in India and have been evolved by modifying Western types, but these are by no means as efficient as they might be made. A scientific study of the implement is required and dynamometer tests in various soils of many modified types have to be made before designing to suit Indian soils can be undertaken. These remarks apply also to other implements, and further information is given under Question 14.

Other fields of investigation are suitable water-lifting devices, the study of sub-soil water movement and the effect of heavy withdrawal of sub-soil water for irrigation purposes.

I am glad to say that in the Punjab, sanction has recently been accorded to the appointment of an Assistant Engineer for a period of two years to take up the question of implement design, but I am of the opinion that a suitably trained man will not be forthcoming on a short-term appointment, and as the field of investigation is sufficiently large to occupy several experts for the full term of service, at least one permanent official is required for the Punjab.

(*c*) The most important item of research in the Engineering Section which has not yet been undertaken is the installation of a hydraulic station for the measurement and investigation of the quantity of water required to mature the various crops under the various conditions of cultivation practised. The importance of such a station cannot be over-estimated, particularly as all the waters of the five rivers of the Punjab are already devoted to irrigation, and if the irrigated areas are to be extended then the application of surplus water has to be stopped.

QUESTION 2.—AGRICULTURAL EDUCATION.—My experience of agricultural education relates to that imparted at the Agricultural College at Lyallpur.

(i) The supply of teachers in this institution is sufficient to meet the requirements of the courses as already arranged; advantage is taken of all new specialists who are appointed to the department, and these officers are required to give a series of lectures in the subjects of which they have made a special study—thus securing for the students a very high standard of instruction comparable with instruction of a similar kind in Britain.

(ii) There is an urgent need for the extension of teaching facilities at the Agricultural College and Research Institute at Lyallpur. With the appointment in recent years of the several specialist officers such as the Fodder Specialist, Fruit Specialist, Entomologist, second Agricultural Chemist, Bacteriologist, &c., laboratory accommodation is far from adequate, and also the accommodation for students is very limited. The number of students admitted to the college is approximately one-fourth of the number of applicants for admission, and with the present staff of experts and the addition of a few Laboratory Attendants the teaching facilities could be greatly enhanced if laboratory accommodation for the students was available. At the present time, extension of accommodation is in progress, and a general scheme for further extension during the next few years is—I understand—receiving favourable consideration from Government.

I am not in favour of providing in other parts of the province similar teaching facilities to that at Lyallpur, because the students who receive instruction at Lyallpur are drawn from all over the province and we have at the Agricultural College, for practical and theoretical instruction, facilities which it would be very difficult and expensive to duplicate. I consider it would be a very much better arrangement to develop and expand at Lyallpur, making the institution there as nearly perfect as finance will permit rather than having two agricultural colleges imperfectly equipped.

(iii) I presume that this question refers to the teachers of agriculture in schools. These teachers are members of the Educational Department who have completed a one year's course in agriculture at the Agricultural College at Lyallpur. Experience has shown that the teachers who are drawn from the rural areas take a keener interest in agriculture than the town-bred men take.

(iv) With regard to the Agricultural College at Lyallpur, I am of the opinion that the majority of the students seeking admission are desirous of entering Government service after completion of the course of instruction.

(v) The students admitted to the agricultural college are mainly drawn from the agricultural classes. Particular care is exercised to secure chiefly

"agriculturists," and the few non-agriculturists who enter the college are admitted for special reasons.

(vi) No modification is at present necessary in the courses of study at the Agricultural College, but if the standard is raised of the Matriculation examination, then a recast of the courses will become necessary. Such alteration of the courses can only be arranged when the new standard of the entrance examination has been decided upon. Such alteration will not present any great difficulty, but provision will have to be made to ensure that the complete education of the student does not become more expensive than at present.

A more expensive education would debar many of the sons of the poorer class farmers from the benefits of an agricultural training, and their places would most likely be taken by the sons of the more wealthy townsmen, thus defeating the object of an agricultural training for those who are in most need of it and who would be most benefited by such a training.

(vii) From an inspection of the agricultural work carried on in a few of the vernacular middle schools, I consider that (*a*) nature study is of distinct benefit to the boys as it creates an interest in the animal and plant life around them and stimulates the faculty of observation; (*b*) As agricultural education in schools stands at present, I am more in favour of the school plot than of the school farm; the latter is expensive in capital cost of land and equipment, and I do not consider that the average teacher who has had only one year's agricultural training is likely to get the best results from an area of five acres. Such an area requires a pair of bullocks, and these, with establishment charges, make the recurring charges heavy. In the school plot, the elements of agriculture can be taught and interest in the subject awakened.

(viii) The majority of graduates from the College of Lyallpur have been taken into the Agricultural Department. Some of our old students have been taken into the Co-operative and Irrigation Departments; a few having gone back to the land or obtained private appointments.

(ix) The main attraction in an agricultural education at the present time is in the prospect of Government service. There is a small percentage of our students who, themselves or their parents, own land, and who recognise the advantage that an agricultural training will give them in securing an enhanced income from the land.

The financial benefit, whether it be in Government service or direct from the working of their own land, is the attraction and as the number of students who go back to the land increases, the force of example will have a strong effect in influencing youths to obtain training necessary to obtain the best results from the land.

(x) It has been suggested by the Punjab Agricultural Department that an area of land be set aside for the training in practical farming of post-graduate students from the Agricultural College. The main features of the scheme are, that each of five selected graduates will be allotted an area of land for a period of five years and on this area they can practice agriculture on their own responsibility under the supervision of the Agricultural Department, the area of the land to be such that the graduate can, with careful work, obtain a livelihood commensurate with his position. The details of the scheme are at present under the consideration of the Government.

Facilities for those graduates who desire to take an M.Sc. degree are also provided at Lyallpur, Bangalore and Pusa.

(xi) I consider that the most effective and the least expensive method of education and general propaganda is by means of wireless. I suggest that in the first instance receiving sets be installed at all *tehsil* headquarters in

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the school, and that short talks be broadcast from Lahore weekly or bi-weekly as occasion requires.

The whole Punjab can easily be catered for by one broadcasting station at Lahore. The great advantage of the scheme is that the senior Officers of the various Departments will be in a position to broadcast, thus ensuring that accurate information is disseminated. Apart from its value as regards accurate information and instruction reaching the masses the scheme has very great possibilities from the administrative and political point of view.

(xii) There are 124 *tehsils* in the province, and at a liberal estimate the cost of installing receiving sets would be one lakh of rupees. The maintenance charges would be ten thousand rupees per annum. Assistants of the Agricultural and Co-operative Departments would operate the receivers for an hour or two, say twice weekly. A subsidy would require to be paid to the broadcasting company for the use of the station. The amount would depend on the number of departments using the station. For agriculture, education, veterinary and health, I consider that Rs.12,000 per annum would be a reasonable rental for the company.

QUESTION 3.—DEMONSTRATION AND PROPOGANDA.—(*a*) Practical demonstration has been the chief factor in improving the methods of cultivation in the province.

(*b*) Demonstration is most effective when carried out in the farmers' own fields, and it is essential that the demonstration is successful. To ensure success the Assistant in charge of the demonstration must know more than the farmer. As the Agricultural Department is young and the Assistants are trained in the Department, they have the necessary scientific knowledge but lack the practical experience of the farmer and, therefore, require the close supervision of the older and more experienced members of the staff. Such supervision is not always easy owing to the small number of experienced officers and the large areas over which they have to exercise control, and an increase in the staff of experienced officers would lead to more effective and more numerous demonstrations.

(*c*) The Punjab farmer has been somewhat chary in the past in accepting expert advice, but in recent years there has been a distinct change, and as a result of the successful work done by the department in the short time of its existence, the farmer is now much more inclined to seek advice. I consider that with an increase in demonstration work and judicious advertisement the spread of improved methods will follow as a natural consequence.

(*d*) One of the most marked examples of the success of demonstration was with regard to damage to wheat by ear cockle in the Muzaffargarh district some years ago.

The farmers attributed the failures of the wheat crop to various climatic causes and were decidedly sceptical when Mr. Milne (who was then Economic Botanist) explained that the enormous loss of wheat each year was due entirely to ear cockle, and could be eradicated by the sowing of seed from the affected grains. Ultimately, the Economic Botanist carried out demonstrations in the farmers' own fields, on the understanding that if his crop was worse than the farmer's crop he would pay for the loss, and if the crop was better than the farmer's crop then the farmer would be the gainer.

The demonstration was entirely successful, the result being that the farmers now either clean their seed or purchase clean seed from elsewhere, and ear cockle has been eradicated from the district.

QUESTION 4.—ADMINISTRATION.—(*b*) From the engineering point of view there are a few lines of investigation and development which are of All-India importance and which would be carried out with greater uniformity and at less expense if controlled by the Government of India.

First in importance is the installation of hydraulics experimental stations of at least one per province for the measurement of water required for the various crops. Although the Agricultural Department has been in existence for twenty years, it is regrettable that so very little is known about a subject of such vital importance to agriculture.

In order to have data collected under uniform conditions as regards design of the distribution stations, modules, recording instruments and other appliances, it is essential that the work be carried out under the control of one central authority.

With regard to implements, much has been done in the various provinces to modify and design types suitable to Indian conditions, but the results are far from satisfactory, and many types of comparatively useless and expensive implements have been imported. Investigation, design and experiment carried out under one controlling authority would lead to greater uniformity in design and to the simplification and consequent reduction in manufacturing costs. This problem is one which has to be tackled in India, as help from foreign manufacturers is likely to prolong the period of imperfect design and to keep up the costs. When satisfactory types of implements have been evolved, they can be manufactured in India, or the greater part of them can be manufactured in India at considerably less cost than the imported articles. In proof of this statement, I may say that very recently an implement was designed and one hundred samples were made in India, as a test lot, certain steel parts which could not be produced in India were imported, and the complete implement at Lyallpur cost Rs.36; this cost can be very much further reduced if manufactured in large numbers. A quotation from a well known British manufacturer for a test lot of five hundred of the same implements amounted to Rs.70 per implement at Lyallpur.

(*c*) (iii) There is very great room for improvement in the district and village roads of the province, the latter are unmade or little better than cart tracks and in many cases, cart transport is rendered impossible on account of a few impassable breaches and holes. Much could be done to render these unmade or *katcha* roads more satisfactory by the occasional application of a *katcha* road leveller. The farmer is not going to grow surplus grain if it is impossible or exceptionally difficult to convey such surplus produce to market. The maintenance of good serviceable roads will undoubtedly stimulate agricultural development.

(iv) I have already dealt with wireless under Question 2 (xii) and would simply add here that as Calcutta and Bombay will have high powered broadcasting stations completed this year, I consider that no time should be lost in developing broadcasting in the Punjab for the education of the people and for communication of market reports, etc.

QUESTION 8.—IRRIGATION.—In most of the districts of the province there is room for development of irrigation. In the canal irrigated areas there are a certain number of isolated tracts of uncommanded land; many of these might be irrigated by lift irrigation from the canal and in some cases by lift irrigation from the sub-soil by means of tube wells. In districts such as Multan, Muzaffargarh and Dera Ghazi Khan, there are large tracts of good land which offer scope for considerable development by lift irrigation from the river and from the sub-soil.

At the present time, little is known about lift irrigation from the sub-soil when carried out on a large scale. One single tube well will command some three to three hundred and fifty acres per annum but working expenses can be very considerably reduced if a number of tubes are worked from one central power station.

The Punjab Government has recently approved of a scheme to put down a battery of sixteen tubes with the object of collecting data regarding the flow of sub-soil water. It is possible that this project may be carried

out in one of the water-logged areas of the province thus serving a three-fold purpose, the supply of the required data, the reduction of sub-soil water level and the reclamation of land partly out of cultivation owing to water-logging. In such an area where sub-soil water level is close to ground surface, the working expenses of a lift irrigation scheme is very considerably lower than in an area where water has to be lifted from a considerable depth.

An Executive Engineer has very recently been attached to the Agricultural Engineer for a period of one year to assist in the carrying out of lift irrigation schemes in the Punjab. There is vast scope for this work and a permanent staff is very desirable.

With regard to the ordinary masonry or open wells, considerable work has been done by the Agricultural Department during the past fourteen years in augmenting the water supply to these wells. Tubes are inserted in the well floor and a lower stratum of water is tapped, the system adopted depends on the geological formation in which the work is being carried out. Until a year ago, the number of well-borers employed on this work was twenty and three well supervisors were in direct charge of the borers. A year ago, forty additional borers were appointed and at the present time a further sixteen are under training. As there is considerable demand for the services of these borers it is proposed to gradually increase the number to one hundred and forty.

Attention has also been given to the improvement in the water lifting gear for ordinary wells. Chambers for testing various types of water lifting appliances have recently been constructed at Lyallpur and a simple and inexpensive type of roller bearing has been designed. There is a very large field for the improvement of water lifting devices and an Assistant Engineer has been sanctioned for a period of two years to carry on these investigations, but it is very doubtful if a suitable Assistant with the necessary training combined with inventive faculty will be forthcoming on a short term appointment.

Extension of irrigation by the methods mentioned above has been delayed chiefly owing to financial stringency and to lack of the necessary staff required.

QUESTION 9.—SOILS.—(*a*) (i) and (ii). There are areas on the Upper Jhelum Canal in Gujrat District, on the Lower Chenab Canal in the Gujranwala District, and on the Upper Bari Doab Canal in Amritsar District, which are water-logged due to seepage from the canals and some of which have become *kallar*.

Much could be done to reclaim these areas by drainage, flow and pumped, and by washing of the soil.

(iii) Yes, drainage and washing of the soil at Narwala in the Lyallpur District has a marked effect in bringing into cultivation land which was previously barren. The work was carried out eleven years ago and good crops are still obtained on the land but there are already signs that if the soil fertility is to be preserved, further treatment will again be necessary. There is ample scope in the province for the Chemist and the Engineer to deal with similar areas of *kallar* soils.

(*b*) (ii) Areas in the Gujranwala District have deteriorated very considerably in recent years by the rise in the level of sub-soil water and

(*c*) I am of the opinion that considerable improvement would be effected by pumping from the sub-soil. As much of this land wastage is due to seepage from canals I consider that the lining of the existing canals should receive careful consideration. Canals can be lined when in flow; therefore, there is no danger of loss of crops caused by prolonged closures.

QUESTION 10.—FERTILIZERS.—(*f*) The production of cheap fuel by the growing of trees on a portion of every farm and extensive propaganda against the use of cow-dung as fuel.

QUESTION 11.—CROPS.—(c) In the Punjab, the introduction of American cotton of the varieties known as 4-F and and 285-F by the late Economic Botanist. 4-F was raised from one single plant in 1909 and is now grown on practically one million acres in the province. For many years this cotton has obtained in the market a premium of not less than four annas per maund over the price received for the indigenous varieties.

The introduction of 8-A wheat by the Economic Botanist marked a very decided improvement in that cereal. When I visited several flour mills in Britain a few years ago, the miller asked for as much 8-A wheat as we could send. The additional profit obtained from that variety over others was not less than two per cent. and in these days of keen competition this percentage often marks the difference between profit and loss.

QUESTION 14.—IMPLEMENTS.—(a) This question has been dealt with to some extent under Question 4 (b). I may add that the majority of the implements and machines in use leave very considerable room for improvement and modification to meet Indian conditions.

The agriculturist has been more badly treated than any tradesman in the world in the fact that he is provided with a very great variety of imperfect and inefficient implements with which to perform the various operations required in agriculture. This state of affairs is probably due to the fact that engineering is more divorced from agriculture than from the majority of trades. To evolve a suitable implement the very closest co-operation between the agriculturist and the engineer is necessary, both officers require to have a special faculty for the work and with a suitable combination there is a vast field of work.

I consider that this work should be carried out under the Central Government with the object of eliminating unnecessary types in different Provinces and arriving at a reasonable number of standard types and thus reducing costs.

In agriculture, the most important of all implements is the plough. Modifications have been made on Western implements which have rendered them more suitable for work under Indian conditions, but they are still very far from being efficient or completely suitable for the work to be done. It is of fundamental importance that this line of investigation be taken up seriously.

Regarding new machinery, it is essential that a mechanical crop sampler be produced. The present method of estimating crops leaves too much to the human element and is consequently very unreliable. There is no difficulty in producing such a machine but facilities are required.

(b) The cultivator is on the lookout for improved implements; if types are produced which suit Indian conditions, the cultivator will take them up, and in the present state of agricultural development, little additional propaganda will be required to achieve this.

(c) At present, manufacturers of improved implements are mostly foreign to India. The agricultural experts have their own ideas as to what is required in an implement (unfortunately they generally differ) and when in Britain or the Continent, they give their ideas to the manufacturers some of whom upset their works programme in order to produce a limited number of implements which prove to be more or less useless and a repeat order is never given. Hence the necessity for standardization and production in India to ensure cheapness the necessary steel wearing parts being imported until such time as India can prepare these.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(f) The chief industry of the province is agriculture and it is regrettable that so few facilities have been provided for the improvement of the tools and appliances required in its pursuit. I consider this line of investigation to be of fundamental importance to the betterment of agriculture.

Mr. T. A. Miller Brownlie.

QUESTION 23.—GENERAL EDUCATION.—(a) This opens up a very big question but a study of conditions in Britain shows that the effect of education has been to draw boys and young men away from the country to the towns where they engage in the various trades and professions. The result is that to-day the land is worked by a class less intelligent than it was some few generations ago.

The Punjab differs from Britain in so far that, whereas Britain is largely industrial, the Punjab is entirely agricultural.

The Punjab does not possess the industries to absorb the educated youths from the rural areas and if these boys are educated beyond the elementary stage, they become unwilling to go back to the land and take their coats off, but wish to proceed to the matriculation stage, drift towards the towns for employment—preferably under the *Sirkar*.

To keep the masses on the land I do not consider that education in rural areas should be carried beyond the elementary stage. That will enable the people to carry on the business of agriculture intelligently and economically.

The vast majority of farm helps in Britain are unable to write a letter ten years after leaving school and yet they have all suffered compulsory education up to the age of thirteen or fourteen.

QUESTION 24.—ATTRACTING CAPITAL.—(a) Grants of Government land on long leases have been given to men of capital in the past on conditions which necessitated the cultivation and development of the land.

Although many of these grantees have, and are still carrying out the conditions of their lease, all have not done so and a few delinquents are an undoubtedly bad example to the populace. Not only men of capital but men of enterprise also should be chosen and the conditions on which leases are granted should be much stricter and more detailed than they are at present and these conditions should be rigidly enforced.

The example of successful farmers has already created more of a demand for land than that which existed a few years ago and it is to be expected that this demand will increase as the result of demonstration and propaganda.

(b) In many cases, want of capital, but more often it is the general apathy and want of enterprise of the people. If a few hours work per day suffices to earn a living wage, there is general reluctance to do any extra work and earn more money. There is an indication that times are changing and farmers are quite willing to obtain seed which is known to be better than the type they have been accustomed to as this yields more profit without extra labour.

Modern implements generally cost more than the indigenous ones and it is only after very definite demonstration that the use of the modern implements will increase profits without material extra labour, that the farmers are induced to obtain these.

Experience shows, however, that there is a growing desire for improvement. Cheaper implements, more demonstration and propaganda, a plentiful supply of good seed of improved types will all tend to result in general agricultural improvement without disturbance of the habits of the people.

QUESTION 26.—STATISTICS.—(a) (ii) The present method of estimating the yield of agricultural produce is inaccurate as it depends solely on the human element.

A mechanical crop sampler is required, a machine which can be taken across, say, an area of standing wheat and will cut a narrow strip, threshing and bagging being carried out simultaneously.

I have referred under Question 14 (a) to this machine which I consider a necessity. Implement manufacturers in Britain are not prepared to take up the design of such a machine on account of the very limited number required, but there is no difficulty in designing such a machine, only time is required and the facilities for its construction.

Oral Evidence.

45,523. *The Chairman*: Mr. Miller Brownlie, you are Principal of the Lyallpur College of Agriculture, and you hold the post of Agricultural Engineer to Government?—I do.

45,524. Would you give the Commission quite shortly an account of your own training and past appointment?—I was trained in the Glasgow Technical College, Glasgow University, articled to a firm of Civil Engineers in Glasgow for a period of five years; I spent one year in York as a Civil Engineer; I was appointed to the Public Works Department in India in 1905. After four years, I was appointed Municipal Engineer in Amritsar, Punjab; I spent five years there, and was appointed Agricultural Engineer to the Punjab Government in 1915; I still hold that appointment.

45,525. On page 708 of your note you say that in the engineering section of the department progress during the past ten years has been very seriously hampered by want of trained assistants. If Government were willing to engage the necessary officers, do you think it would be difficult to attract the right type of assistant?—That is a question of the remuneration offered; at the present time Government has agreed to appoint an assistant for the improvement of agricultural implements; the salary offered so far has not been sufficient to attract the right type of man.

45,526. Would you expect to find the right type of man for that particular purpose in an agricultural implement factory?—Not necessarily; we are more likely to find him I think in any of the other engineering works; it does not necessarily require a man who has been trained on agricultural implements; a man of inventive faculty is more necessary.

45,527. And with sufficient adaptability and elasticity of mind to see matters from the agricultural point of view, I suppose?—Quite so.

45,528. In the meantime, until a special appointment is made to deal with agricultural implements, the same officers who are responsible for water lifting, tube wells and the like, are also responsible for carrying out experiments designed to improve agricultural implements; is that so?—Yes, until the end of December last that was one officer; in December a second officer was appointed as Executive Engineer in charge of lift irrigation.

45,529. Has an officer who is responsible for lift irrigation and for well construction enough time to attend also to agricultural implements?—No, he has not; lift irrigation at the present time is more than sufficient for one man.

45,530. On page 709 you suggest that an important line of research which might be undertaken in the engineering section would be the installation of a hydraulic station for the measurement and investigation of the quantity of water required to mature the various crops under the various conditions of cultivation practised. Are you confident that that work should be carried out by the Engineering section rather than by the Irrigation Department?—It requires an engineer with experience in water distribution; whether he is obtained from the Irrigation Department or any other department I do not think is material.

45,531. Are the teachers in this Agricultural College engaged in any research work?—Yes.

45,532. Is that research work carried on more or less in their own time, or have they time both to teach and to conduct research?—There is time for a certain amount of research for some of the officers; it varies; some have more than others.

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45,533. Do you regard it as an advantage to the college that teachers should do a certain amount of research work?—Yes, I do; it keeps one up to date.

45,534. Do research officers not employed as teachers in the ordinary way give occasional lectures in the college?—Yes, our specialists give a series of lectures.

45,535. About how often does each officer lecture?—Take for example the Fruit Specialist; he would come in for a short course of perhaps five or six lectures according to circumstances; the Bacteriologist similarly would give a short series in the course. For example, lectures that have been carried out in the past by the Economic Botanist are now divided over the specialist officers in that department, the Economic Botanist taking the main part of the course, the specialists coming in as required.

45,536. I see you are not in favour of providing in other parts of the province similar teaching facilities to those at Lyallpur?—Not at present.

45,537. Do you think that the problems of the *barani* area are likely to receive due attention at an institution situated in a canal colony?—It is only natural that when the first institution is put down development should be in the neighbourhood of that institution; as we expand we can take up other areas in the province.

45,538. You do not think there are any physical limitations which would prevent your dealing with the problems of the *barani* district?—I do not think so; research can be done here, the officers visiting the various areas to study local conditions.

45,539. You give us a note, in answer to our Question 2, section 7, on page 710, of your views on the agricultural work carried on in the vernacular middle schools; have you personally visited those schools?—I have.

45,540. You prefer a school plot rather than a school farm; is that so?—Yes, but I think there is a little misunderstanding.

45,541. What is the misunderstanding?—With regard to the plot, it depends very largely on the number of pupils in the school what area is required, and sometimes in a fairly large school, the area necessary to give each boy a small plot to work in would become a moderately large area which might be termed a farm, two or three acres. I think the general idea of a school plot is an area of about half an acre.

45,542. It is sometimes suggested that the difficulties of management do not arise, at any rate in so intense a degree, in the case of a small plot as they do in the case of a farm?—That is my impression.

45,543. If there is obvious failure to manage the farm on lines which would make it a commercial success, the technical lessons intended to be conveyed to students are likely to be a little offset by the discovery on the part of the local cultivators that the man in charge of the farm knows nothing of his business?—I think that was the tendency at first; I do not know that it holds at present; I think it is gradually disappearing.

45,544. Because of a better understanding of the purpose of these farms, or because of a better standard of knowledge on the part of the teachers in charge?—I think the teachers are doing rather better now and that the farmer has rather more respect for them than he had when the scheme started.

45,545. I see that you look forward to wireless telephony becoming an active agent for agricultural education?—Yes, I think there is a very big future for it.

45,546. Would the multiplicity of vernaculars present some difficulties in arranging a programme?—I do not think so in the Punjab; it can be covered practically by three dialects.

45,547. I judge from your answer to Question 3, section (*c*), on page 711, that it is quite definitely your experience that the cultivator is much more inclined nowadays to seek and follow the advice of the Agricultural Department than was the case some years ago?—Yes.

45,548. In your answer to our Question 4 (*b*) on page 712, you are making a comparison between the cost of agricultural implements made locally and abroad; does the local price include any profit?—Yes, this particular example I have given was made by a private engineering farm in Karachi.

45,549. How about the relative merits of the steel used?—We imported the steel for the wearing points.

45,550. Is it your habit to import the steel when you require it?—For the wearing points of agricultural implements you cannot get steel in this country.

45,551. You import that and forge it here?—It is imported in the forged condition.

45,552. Can you forge it here without loss of temper?—No, we do not forge it; it is imported from abroad in the shapes required for use.

45,553. Is that because it would lose temper and quality if it were heated?—The process of manufacturing those points abroad is more or less a secret process and none of the firms in India have yet produced a steel of the quality that is required.

45,554. *Professor Gangulee*: Have you approached Tata's?—Yes.

45,555. *The Chairman*: On page 712 in your answer to our Question 8, I see you think there is a future before the type of irrigation known as lift irrigation from canals?—Yes.

45,556. Is there any suggestion that Government is to undertake any of these schemes?—I think they should be carried out by Government.

45,557. In the mean time, Government has not undertaken any?—Not so far, owing to financial stringency; the matter has been taken up now.

45,558. Are you as Agricultural Engineer responsible for tube well construction in the Punjab?—I am.

45,559. How many tube wells a year has your department been sinking?—I distinguish tube wells from the smaller wells by the discharge; anything discharging over half a cusec I consider a tube well; since I came to the department in 1915 we have put down 21 tube wells.

45,560. Taking your own classification, can you give us any idea as to how many tube wells have been sunk in the same period by private firms, if any?—I am afraid I cannot.

45,561. Have many been sunk by private firms?—Some have been sunk, but I cannot give you the number.

45,562. Can you give us any idea? Do you think the department has constructed as many tube wells as private persons?—No; there are other agencies; the Irrigation Department have put down a certain number of tube wells; the North Western Railway put down a number of tube wells, and there are private firms in Lahore who have put down a certain number.

45,563. Has the Irrigation Department plant for manufacturing tubes and strainers?—Yes, they have their central workshops in their department at Amritsar.

45,564. *Sir Henry Lawrence*: What is the average cost of such a tube well?—At the present time about Rs.22,000 for 1½ cusecs.

45,565. *Sir Ganga Ram*: At what depth?—A depth of about 150 ft.

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45,566. *The Chairman*: Then, on page 712, you also refer to a scheme to put down a battery of 16 tube wells with the object of collecting data regarding the flow of subsoil water. Will you be carrying out that experiment or will the Irrigation Department be doing that?—The intention is that we should carry it out; we have appointed an Executive Engineer who is at present working out the details of such a scheme.

45,567. I think the idea is that those 16 tube wells should be pumped by one prime mover?—We are considering that at the present moment; that is the intention; we are putting up estimates comparing the cost of different types, but so far as we can judge from the data we have collected, the central power station will be cheaper than individual plant.

45,568. Is the primary object in carrying out this experiment to discover the flow of the subsoil water?—Yes, we know nothing about that. Ten years ago I suggested that a scheme of that sort should be carried out with a view to the development of tube well irrigation in the province, and now that the Mandi hydro-electric scheme has been actually started and cheap power will be available in the course of two or three years, it is necessary that we should know something about the flow of subsoil water. We are inclined to suspect that with a battery of this sort we may get a very large drop in water level which would render pumping uneconomical.

45,569. A local drop in the subsoil water level?—Yes. But without an experiment we cannot say anything definite.

45,570. Quite apart from this special problem as to the feasibility of sinking a battery of tube wells, have you accurate data in this province to show the conditions of cultivation which justify, economically speaking, the sinking of a tube well?—Yes, on areas that are not being cultivated, the landowner can afford to pay the cost, providing the subsoil water level is within a reasonable distance of the ground surface.

45,571. What do you call a reasonable distance?—Not exceeding 25 feet; beyond that there is a certain amount of doubt. We find that owners who make enquiries about the initial cost and running costs of tube wells are not inclined to take them up when the water level is more than 25 feet.

45,572. Because of the cost of sinking and the cost of pumping?—The cost of pumping; it is the recurring cost that is heavy.

45,573. Have tests been carried out to show what area of land can be irrigated from one tube well giving a certain discharge?—No actual tests have been carried out; we base the area commanded under the tube well on the canal rates for the neighbourhood.

45,574. On the turn of water which is theoretically the basis of charge for canal water; is that the point?—The area irrigated; for example, here on the Chenab Canal a cusec will irrigate 88 acres in the *kharif* season and 176 acres in the *rabi* season. We base our land area on that.

45,575. How are those figures known?—From past experience; the Irrigation Department have actually fixed that as the duty of one cusec running throughout the canal year.

45,576. But do you know that the Irrigation Department do not claim to have made any accurate experiments to fix these figures?—No; I have been in the Irrigation Department for two years and the canal discharge is measured at different points; each canal is measured, the discharge is taken on the canal, the quantity of water is known and the land area that is cropped each year is measured; it is from the result of experience that one comes down to the duty of a cusec.

45,577. What delta would you allow for sugar cane in this Province?—I have not much experience of sugar cane; it depends on the type of cane; it requires from 4 to 7 or 8 feet.

45,578. And for wheat?—12 inches.

45,579. Do you think more research work requires to be done on the economics of the tube well?—I do.

45,580. In what direction?—With regard to the flow of subsoil water; we know nothing about that.

45,581. But you think once you get your water to the surface at a particular price, the agricultural economics, if I may so term the problems, are known with sufficient precision; is that your view?—Yes, that is my view.

45,582. You do not think there is much more to be learned in that direction?—I do not think so.

45,583. You give as the second reason for this experiment the reduction of the subsoil water level and as the third the reclamation of land?—Yes, we have some so-called waterlogged areas in the Punjab; in some of those areas canal irrigation has been stopped, and therefore cultivation has stopped. If water is drawn from the subsoil in these areas, the land can again be brought under cultivation; I anticipate that the land can be brought under cultivation.

45,584. Do you take the view that waterlogging is likely in the future to become a very serious matter in this Province?—I do, and it is increasing.

45,585. Do you think pumping from tube wells is likely to be applied to any great extent as either a preventive or a curative method?—I do not think it is the proper method; it may be necessary in some parts. Local conditions have to be considered; I think the first question is that of stopping seepage to a large extent by canal lining and treatment of the land by drainage and pumping from the drains, more than by pumping from tube wells.

45,586. If pumping from tube wells is to be an important factor, would you suggest that the Irrigation Department should deal with it or that your department should do the work?—I do not think it is material which department does it; the same experience is required.

45,587. In the case of pumping from a tube well, would your suggestion be that the water would be returned to the canal and then sold in the ordinary way?—Yes.

45,588. And in the case of pumping from a drain, would the same apply?—It would return to the canal; you are pumping because there is no land drainage, and you must return the water to the canal.

45,589. Has the proposal to sink this battery of tube wells for experimental purposes been definitely approved by Government?—I have no information on that point.

45,590. *Mr. Barron*: I think you are still hunting for an area in which to conduct the experiment, are you not?—We are, yes.

45,591. When you are able to recommend a definite area, Government will then consider whether to adopt the scheme or not?—Quite, it is a question of costs; I believe the general principle of having a scheme of this type has been approved.

45,592. If a suitable area can be found?—Yes.

45,593. *Sir Henry Lawrence*: What would be the extent of the area proposed?—6,400 acres.

45,594. There would be 16 wells in an area of 6,400 acres?—Yes, 10 square miles.

45,595. *The Chairman*: I see that it is estimated that, excluding the costs of cultivation but including interest on capital outlay at seven per cent., and depreciation at 7½ per cent., the running costs amount to Rs.40 per

acre cropped, and this for a lift when the water level does not exceed 30 ft.?—Which scheme is this?

45,596. This is on page 23 of the revised five-years programme;* the conclusion is that the cropped area being 87½ per cent. of the cultivated area, the running costs per acre of cultivation would be Rs.35?—This has not been prepared by me; if you look at page 25 you will see my figures.

45,597. Are you familiar with the figures to which I am referring?—It has not been prepared by me, and I do not quite know how those figures are arrived at. In getting at the cost of cultivation it all comes down to the question of lift.

45,598. But here is an estimate where the lift does not exceed 30 ft.?—Yes.

45,599. If the tube wells were operated by Government, Government would have to charge the cultivators Rs.35 per acre in order to cover the working expenses?—Yes.

45,600. The memorandum goes on to say that this eliminates from practical consideration any prospect that owners of wells over areas of the size contemplated would consent to substitute for their own wells a system which contemplates such very heavy *abiana*; is that in general conformity with your expectations in this matter?—I have had one lot of applications from about 60 cultivators in the Jullundur District, and they all agreed to pay a water rate of Rs.60 per acre per crop, provided they can have tube well irrigation; they agreed to pay that and they sent in written applications. That is the highest rate I have known landowners to be willing to pay. As a rule they are willing to pay about Rs.25 to Rs.30 at the outside.

45,601-2. So that you do not agree with that conclusion; namely, that having to charge *abiana* at Rs.35 per acre would put the scheme out of court?—I do not agree.

45,603. *Sir Ganga Ram*: When you say 30 feet, do you also include the draw-down?—No, normal water level.

45,604. Including that the lift will be more than 40 ft.?—Including that the lift will probably be 42 or 43 feet.

45605. *Sir Henry Lawrence*: What is the depth of water in the Jullundur district from which these cultivators have made this application?—About 25 feet or 28 feet. In this particular scheme where they were willing to pay Rs.60 per acre, it was very much deeper; the water level there was 50 feet odd from ground surface; that is why the rate is so high.

45,606. *Sir Ganga Ram*: Have you taken a section of the soil there?—We made no boring.

45,607. *Professor Gangulee*: Is it not a fact that the water levels in those districts are falling?—Yes, in Jullundur and Hoshiarpur.

45,608. *The Chairman*: Could you tell us something about the work which you are carrying out in deepening existing open wells by sinking a tube into the bottom of the well?—We have at the present moment in the Punjab 60 well borers with the necessary plant and staff and there are 16 more well borers under training at the present time. These borers are distributed throughout the province for the purpose of putting down bores in existing wells and the method of deepening depends on the geological conditions in the locality. If we meet with an impervious stratum we simply pierce that and form a cavity under the impervious stratum; if there is no impervious stratum we put down a strainer.

45,609. And fix a pump?—No; this is in an existing well and the water way area is added to the well area so that the water may be lifted from

* Not printed.

the well and from the tube. It is simply augmenting the supply in the existing well.

45,610. Can you give us any idea of the cost of that work?—The average cost of a boring is about Rs.270 over the province.

45,611. For how many feet?—The average is about 80 feet.

45,612. From the bottom of the well?—Yes.

45,613. *Sir Ganga Ram*: How much per foot?—About Rs.3 and some annas including the pipe.

45,614. *The Chairman*: Is there a very large demand from cultivators for that class of work?—There is a very large demand.

45,615. Can you satisfy that demand?—We are doing our best now with this increase of staff which we have got. Up to about two years ago we only had 20 borers; now we have 60, and we hope to work up to 140.

45,616. Are you of opinion that your department has a sufficiently accurate general knowledge of the sub-soil water levels in the province to advise cultivators as to the feasibility of sinking tube wells?—Not in all districts; that knowledge only applies to places where we have put down a considerable number of bores.

45,617. Has Government put down any experimental bores?—Yes, they put down some each year.

45,618. At Government's expense?—Yes.

45,619. And if you strike water do you develop that and sink a tube well?—Frequently we put it down in a privately owned well as a trial. We ask the owner to agree that if it proves successful he should pay the cost; then of course he works the well and gets the benefit of the boring; otherwise we simply withdraw the tube and there is very little loss to Government apart from labour expenses.

45,620. On page 713, in answer to our Question 9 (*c*), you suggest that the possibility of lining the existing canals in order to prevent seepage ought to be inquired into, and you add that canals can be lined when in flow. How is that achieved?—By means of a caisson and compressed air. I designed one 10 months ago for the Punjab Irrigation Department; they were somewhat doubtful about this and they sent Home for a design from a firm and it was found that the firm's design was identical with my own design.

45,621. You move the caisson about over the floor of the canal until you have completed the lining process?—Yes, for putting in a concrete floor 50 feet long and 25 wide.

45,622. Would the use of the caisson add greatly to the expenses of lining in the canal?—I worked that out with the Superintending Engineer here and I have not got his figures; he had to get some final data in the matter, but he told me that the result of his calculations was that it costs very little more to line when the canal is in flow than when the canal is closed.

45,623. On the same page, in answer to Question 10 (*f*), you talk about the production of cheap fuel. Would you suggest the growing of trees along the divisions of fields and also lining the roads?—I think up to a certain extent I would put them along the roads for the benefit of the shade; I would not recommend the growing of trees to the divisions of fields; for any additional fuel that may be required apart from the lining of roads, I would put down small plantations.

45,624. Because the same quantity of wood is less liable to damage the yield by casting a shadow on the crop: is that your point?—Yes.

45,625. On page 714, in answer to Question 14 (*a*) , you express yourself as being in favour of the Central Government undertaking the production of, or at any rate the research into, agricultural implements?—Yes, I think that is very essential.

Mr. T. A. Miller Brownlie.

45,626. Principally in order that a needless multiplicity of types may be avoided?—That is the main reason and it would also avoid a certain amount of duplication work if it is done under one central charge.

45,627. So far as that is true does it not apply to all research?—Of course; but you want to avoid duplication.

45,628. Who, do you suggest, should manufacture these agricultural implements once improved types have been evolved?—If we can get types that are recognised as suitable for particular areas then private firms will take up the work. The difficulty just now is that there are a great many types wanted and very often the number produced of one type is very limited and it costs the firm a very large sum.

45,629. What type of crop sampler are you thinking of at the bottom of page 21?—That was brought to my notice by our last Director of Agriculture, Mr. Jacob, who was dissatisfied with the method of estimating crops in the Punjab at that time. He said it left too much to the human element and asked if a sampler could not be made up and I sketched out at that time a design for a sampler which would go through the field and cut a definite strip, thrash and weigh the produce.

45,630. By that means you would be able to carry out a large number of crop cutting experiments with accuracy?—Yes; and very quickly too.

45,631. *Sir James McKenna*: You have told the Chairman that the teaching staff do a certain amount of research. How much teaching, for example, does the Agricultural Chemist do in the College?—I am afraid I cannot give you the information straight off.

45,632. I mean roughly. He takes the most advanced course, I think?—Yes, it is a matter of two or three periods a week.

45,633. In which subjects do these specialist officers give special courses?—Most of these officers are specialists in crops. What are the arrangements for the general teaching of ordinary botany and applied botany?—We have an Associate Professor of Botany.

45,634. Does the Professor of Agriculture have a district charge in addition to his duties as Professor of Agriculture in the college?—Yes, he has district work, and he is also Deputy Director of Agriculture for the Lyallpur Circle.

45,635. How many districts does his work embrace?—His work embraces the districts of Lyallpur, Jhang and Sheikhupura, also the British Cotton Growing Association farm at Khanewal.

45,636. Apart from his teaching as Professor of Agriculture, he carries out the duties of Deputy Director of Agriculture over that area?—Yes.

45,637. That is the contribution that he makes to research?—Yes.

45,638. Have you formed any estimate of the standard of degrees being given in Agricultural Science by the Lahore University?—I do not quite understand you.

45,639. Do you think the standard is high or low, ordinarily?—I think the standard, on the whole, is good.

45,640. What arrangements are made for examining for the degree?—There is one internal examiner and one external examiner; a Professor of this College is the internal examiner, and for the external side there is an outsider.

45,641 Is any emphasis laid on practical agriculture in the examination as opposed to the theoretical side?—Yes, there is a regular examination in practical agriculture which is part of the subject.

45,642. Is any special emphasis laid on it? Suppose a boy passed his theory examination, and was just on the margin with regard to the practical examination?—Then he is failed.

45,643. *Professor Gangulee*: Are you in favour of raising the standard of admission?—I would like to see it raised.

45,644. Would you like to see the entrance standard raised to the intermediate class? I am afraid if you are going to have the intermediate class as the entrance standard, then you will require at least a three years' course after that, and that is going to make education for the student here more expensive than it is at present, so that we would probably lose the men we are trying to get.

45,645. Perhaps if you raised the standard of entrance you could give more efficient education; for students would come to you with a certain amount of preliminary scientific training?—They would but as I say, by admitting them here at a higher stage we would require to give at least three years.

45,646. On what do you base your definition of agriculturists and non-agriculturists? Do you follow the schedule indicated by the Punjab Land Alienation Act?—Yes.

45,647. I understand for certain special reasons you admit non-agriculturists. What are those special reasons?—You will occasionally get a non-agriculturist whose father or he himself may own a fairly large tract of land, and he wishes to go back to it; in a case like that we take the man in because to all intents and purposes he is an agriculturist.

45,648. Provided he has the land and equipment?—Yes, and desires to take it up in order to go back to the land.

45,649. With regard to research carried out at the College, do you as Principal supervise it?—No.

45,650. Who does that?—The research work is carried out under the Director of Agriculture.

45,651. You have nothing to do with it?—No.

45,652. In addition to your work as Principal, are you able to carry on any research yourself?—A certain amount, but not very much. I would like to be able to do a great deal more.

45,653. This additional work as the Principal must be a handicap to you?—It is.

45,654. What improvements have been made by the Agricultural Engineering Department in implements? Can you tell us of any improvements in existing farm implements which you can confidently recommend to the farmer?—The Engineering Section does not recommend implements; it tries to carry out improvements desired by the Professor of Agriculture or Deputy Directors of Agriculture. If they point out that an implement is not satisfactory, and ask if it is feasible to alter it in some way, we try to meet their requirements; and sometimes in doing that we evolve a new type.

45,655. You do not carry on any investigations to improve the existing types?—We wish to do that, and I have applied for an Executive Engineer for that purpose, and Government has sanctioned his appointment for two years, but we have diffiulty in getting the right type of man.

45,656. I suppose you have not been able to devote any attention to implements suitable for *barani* tracts?—No, we have made no distinction between the tracts for which the implements are required.

45,657. On page 173 of the provincial memorandum* certain improved ploughs, harrows and drills are referred to. Do you think the improvements

* Memorandum prepared for the Commission by the Punjab Government (not printed).

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made have reached a stage where they can be handed over to the manufacturers?—Those are now manufactured on the farm, and not by the Engineering Section.

45,658. Have any of these reached a stage where they can be taken over by the manufacturers?—Yes, for example, there is a seed drill and a harrow. I believe they are being made by some outside manufacturers.

45,659. Is your department in touch with any Indian manufacturers?—We are to a certain extent. We have had trial implements from them, and sometimes get additional ones if they are found satisfactory.

45,660. How does the quality of implements manufactured in India compare with that of imported implements?—There is a very great difference. The quality of implements manufactured in India is poor.

45,661. Is it the steel which is poor or the design?—The steel does not often exist. The design is poor as a rule, but sometimes the implements are copied direct from an imported pattern, and then the design is right to a certain extent, but the material is bad. When we make implements here we import the wearing parts.

45,662. Are you in touch at all with manufacturers of implements in England and other countries?—To a certain extent. We import a number of implements.

45,663. Some manufacturers in England told me once that they did not know the actual conditions prevailing here, and they did not know to whom to go for information. I want to know whether your department is at all in touch with the manufacturers at Home?—We are. When I have been Home on leave I have gone to see the manufacturers and discussed matters, and we have had alterations made in implements and machines. That was also done by the late Professor of Agriculture, Mr. Roberts, and by Mr. Faulkner.

45,664. One often hears the complaint that they do not get adequate information from the Agricultural Department as to the exact requirements of a province?—It is very difficult to give the exact requirements. The agriculturist and the engineer have to work in the very closeat co-operation in order to produce a new implement, and if an agriculturist from this country goes Home and confers with engineers, you cannot expect to have the correct type of implement turned out as a result of that conversation. To my mind, to evolve suitable implements for this country is the work of years.

45665. Do you consider that the standardisation of farm implements such as ploughs, hoes, harrows, etc., would be an advantage?—If we can standardise the implements we will get a very substantial reduction in the cost of production.

45,666. Mass production would reduce the cost?—Yes.

45,667. Do you think a stage has been reached when the plough can be standardized?—I do not think so. A great deal of work has still to be done on the plough.

45,668. Do you think water-lifting arrangements can be standardised?—No. Practically nothing has been done on that, and it is a kind of machine which cannot very easily be standardized. You have to consider the varying lifts, and so on; you cannot standardise the whole machine. So far as certain parts are concerned, many are already standardised.

45,669. But with regard to the most important implement, the plough, nothing has been done yet?—A great deal has been done. Western implements have been modified to a very large extent, but there is still a great deal to be done.

45,670. Do you consider the facilities provided in your workshop are adequate for research in agricultural engineering?—At present, yes. Government has been very good in the last few years in providing facilities. I have said in my note that the chief difficulty is in getting assistants.

45,671. You have all the equipment necessary, but you require more assistants?—Yes. If additional equipment is required from time to time I think it will be provided.

45,672. What has been the cost of the entire workshop?—As it stands at present?

45,673. Yes. Could you kindly give us a statement showing both recurring and non-recurring expenditure?—The capital cost of the workshop as it stands at the present time amounts to Rs.1,44,000, of which sum Rs.28,500 represents the cost of all buildings and Rs.54,500 represents the cost of all machines. From the workshop accounts the expenditure for the financial year 1925-26 amounted to Rs.1,03,400. This sum includes an item of Rs.28,600 for providing gas and electric power for the College and the making of furniture and apparatus etc. required in the College. Rs.31,000 was the expenditure under the head " Workshop " and includes items such as the making of experimental carts, water lifts, cultivator's winnowers and reinforced concrete work in the new power house. The third main item " Boring Works " amounted to Rs.34,000 and represents repair, maintenance and carriage of boring plant, the manufacture of strainers and the cost of experimental bores. The balance of Rs.9,800 was for apparatus etc., for the various sections of the department.

45,674. On page 708, you tell us that certain lines of research are of All-India importance and might be more economically carried out under the direction of a central authority. What lines of research have you in mind? —The hydraulic experimental station is one, and the question of implements.

45,675. What do you consider the best and most effective form of demonstration? Demonstration on the farmer's own land or on your own demonstration farm?—I have not much experience of agriculture proper, but one thing which impressed me was the demonstration carried out on the farmers' own land in the Muzaffargarh district with regard to the elimination of earcockle. I doubt whether that would have had the same effect had it been carried out on a demonstration farm.

45,676. *Mr. Calvert*: You say you are not in favour of providing teaching facilities such as those at Lyallpur in other parts of the province. Is that because the teaching at Lyallpur is not suitable for other parts of the Province?—No. I think Lyallpur should be developed as highly as possible first. To provide similar facilities in other parts of the Province would be a very expensive business.

45,677. Do you think the teaching at Lyallpur is suitable for parts of the Province which are not canal-irrigated?—There is no reason why it should not be.

45,678. You have no *barani* cultivation in Lyallpur?—That is so.

45,679. Two-thirds of the Punjab is *barani* cultivation?—Yes.

45,680. You have no *chahi* cultivation here?—No.

45,681. Sugarcane is practically a *chahi* crop in the Punjab?—That is a question to put to the Professor of Agriculture, but it seems to me it does not matter where the water comes from.

45,682. You have no rice cultivation here?—That again is a question of water.

45,683. You would not favour teaching institutions in other parts of the province which are markedly dissimilar to Lyallpur?—No, unless first of all

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you are going to improve Lyallpur as highly as it can be improved. Make Lyallpur as perfect as you can make it before you start duplicating it.

45,684. We have had evidence given from across the Jhelum river that no research is being carried on in this province of any value to the cultivator, meaning the cultivator across the Jhelum river. Do you not think that is a fairly common opinion across the Jhelum—I have not heard it before.

45,685. Perhaps people from the Agricultural Department have not been across the Jhelum river to listen to these complaints?—The Engineering Section has been.

45,686. You say that a more expensive education would debar many of the sons of the poorer-class farmers from benefiting by an agricultural training. Do you think the sons of the poorer-class farmers should have an agricultural training on these lines?—I do. I think it is the sons of farmers that we want in this college.

45,687. Would you favour a less expensive system of training for the sons of the poorer farmers?—A course corresponding to the two-year course would be useful, but a man who gets to that stage wants to get all the education he can. I do not see why you should put the degree beyond his reach.

45,688. Over 80 per cent. of our cultivators cultivate less than 5 acres. What is your view of the training that should be given to men from that class?—They can take the two-year course here, or they can take the vernacular course. They have a choice. We have the six months vernacular course, the two years leaving certificate course and the four years degree course.

45,689. Apart from the provision of officials for Government service, you have not in this college any course for the man who comes here with a view to going back and improving his own land?—That man will get the instruction he wants in one or other of the three courses we provide.

45,690. Your six months' course has about forty students, and there are four million cultivators in this Province?—Yes.

45,691. What are you going to do if the demand for some form of agricultural education on the part of those four million cultivators increases?—If we get the demand, we can expand to meet it. We have done so already; in response to the demand, we have doubled the size of that class, and we have now a similar vernacular course at Gurdaspur.

45,692. If you look ahead and assume a greater interest in higher agriculture in the future, how would you meet a demand from the some of these four million cultivators for practical training?—By extending our vernacular course.

45,693. That would mean having institutions outside Lyallpur?—Not necessarily.

45,694. You would bring students here from all over the Punjab?—The six months' course is given at Lyallpur and Gurdaspur, and we can arrange to hold it in other parts of the Province also; it does not require the same apparatus or staff as the degree course.

45,695. You know that most of the students who attend these colleges all over India aim at Government service?—Yes.

45,696. Do you think the type of education which turns out men for Government service is suitable for the small man who wants to work with his own hands on his own land?—If we give the degree course it is the best education we can give at the present time, and whether the student subsequently turns his attention to Government service or something else does not matter so far as the college is concerned.

45,697. What type of education would you give the sons of the small cultivators?—As I say, we have three courses here which anyone who wants to may join. It is not what we wish to give the cultivator but what the cultivator wishes to take.

45,698. Have you ever worked out a rough figure for the cost to Government of turning out a B.Sc. in agriculture from this college?—I have not, and it would be difficult to do so, because the college and the research institute are combined. This is not a purely educational institution.

45,699. It would work out at some thousands of rupees?—I cannot tell you; I have not worked it out.

45,700. Is not that cost too great to be reduplicated?—I do not know. If Government can now afford to run an institution of this sort I dare say Government can afford to duplicate it, or enlarge this institution, if there is a demand for the education it provides. The education is undoubtedly benefiting the province.

45,701. Do you not admit that the number of students which Government can educate on these expensive lines is very severely limited by the cost?—I do not know the cost.

45,702. The average land revenue in this province is Rs.10 a head, so that Government cannot give much more than Rs.10 a head back to the cultivator in education?—I do not anticipate that in our time Government is going to take up the question of educating to the B.Sc. stage our four million cultivators, or even a hundredth part of them.

45,703. You have not thought out any way of meeting a possible demand for a big extension of education on the part of the small cultivator?—For a man who wants to go back to the land there is the six months' vernacular course.

45,704. You would stop there?—Yes, or give him the two years' course; but if he wants to take the B.Sc. course, let him.

45,705. You do not think the two years' course and the B.Sc. course are completely out of the question owing to their cost?—No. For the last four or five years we have had 200 to 250 applications per annum for admission to the college, and of those we take 25 per cent. That is from the Punjab, with a small number from other provinces.

45,706. *Sir Ganga Ram*: Do you admit students from other provinces?—A limited number. I think we keep nine seats for them.

45,707. From what other provinces do they come?—From any of them; Bombay, Sind, the United Provinces, the Central Provinces, and so on.

45,708. *Professor Gangulee*: Is this increase in the number of applicants due to the cheapness of the degree?—There is no very great increase in the number of applications from year to year. I think any slight increase which has taken place is due more to the number of students we have taken into Government service in recent years.

45,709. *Mr. Calvert*: Have you much experience of graduates of this college who have taken to farming on their own account?—No. Very few have.

45,710. There is one in Lyallpur?—Yes.

45,711. Is he doing well?—As far as I know. I see him from time to time.

45,712. He has found his training really valuable?—Yes.

45,713. Have you worked out comparative costs per acre irrigated of irrigation from tube wells and ordinary wells?—Yes.

45,714. Can you give me a rough figure? Is it about Rs.40 with the tube well?—It depends on the lift. The tube well is 15 to 20 per cent. cheaper than bullock power from the same depth.

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45,715. Assuming, of course, a sufficient area?—Yes.

45,716. At what point does the oil-engine beat the bullock as a lifting agency?—I do not know of any point at which bullock power is cheaper, unless you are dealing with a very trifling area. In the case of a very small area it may be cheaper; I have not gone into it. There is a limit to the minimum power you can apply economically, but when you do apply it, you have power at a cheaper rate than with bullocks.

45,717. A tube well is practically confined to areas of 200 acres and over?—From 150 acres. It is a question of the time you pump. With a single tube and a single engine, pumping from 10 to 12 hours a day, that would mean 100 to 150 acres.

45,718. In the case of a well with exhaustible supplies of water, bullock power may be cheaper than a tube well in certain cases?—You can hardly compare the two. If you want to compare tube wells with ordinary wells, you will have to compare one tube well with about ten ordinary wells. One tube well is equivalent to ten ordinary wells.

45,719. I was only trying to throw light on some evidence we got elsewhere. On the question of the standardisation of implements, taking Europe as a whole has standardisation proceeded far there?—No; I do not think there has been that co-operation between the agriculturist and the engineer that is necessary. You will still find cases where the manufacturer is trying to sell something without in every case trying to meet the requirements of the agriculturist.

45,720. When attention is drawn to the large variety of ploughs and other implements in India, it is well to remember there is practically the same variety in Europe?—Yes, but not the same variety in use, I think.

45,721. *Mr. Kamat*: With regard to the policy of admitting students to the college which you describe on page 710 of your note, where you say you do admit a few non-agriculturists for special reasons, may I know if it is realised that in effect what you are doing is to turn agriculturists into non-agriculturists and non-agriculturists into agriculturists?—No, I do not appreciate that.

45,722. If, say, 300 men are turned out by your college, most of them will go into Government service. That means you are turning 300 men who belonged to the agriculturist classes into non-agriculturists?—They are being taken into Government service to improve the agriculture of the province I call a man who is engaged in that work an agriculturist; he is employed in agriculture.

45,723. Is that the object with which they are trained, that they should join the Agricultural Service and not farm their own lands?—I say in my note that the majority of students desire to take up Government service.

45,724. I know that is their desire, but I am asking you what the correct policy should be when a college like this is opened. You will admit, I believe, that the main object should be the improvement of agriculture directly at the hands of these agricultural graduates?—Yes.

45,725. Now, to serve its real object, either you must restrict the admission of these graduates from your college into Government service or, in the alternative, you must produce from this college such a large number as to leave a surplus after all the posts in Government service have been filled for actual farming?—I agree.

45,726. As long as the men turned out are all taken into Government service, you are turning what were originally agriculturists into what I call non-agriculturists?—I do not agree there. A man is an agriculturist whether he works for Government as an agriculturist or for himself as

an agriculturist. He is working on the land and engaged in agriculture, and he remains an agriculturist.

45,727. You have said something about wireless and given some details of a scheme. Will you amplify that? On page 711 you say the cost of installing receiving sets in 124 *tehsils* would be something like a lakh, and on the same page you say that for agriculture, education, veterinary and health you consider Rs.12,000 a year would be a reasonable rental for a company which might work a broadcasting station. We would like to have further details about this scheme of yours. For a province like the Punjab you think an initial cost of a lakh and a recurring cost of Rs.12,000 a year would be ample?—No, but that would start the scheme and put a receiving station into a school in each tahsil. That would be a commencement. I should like to see receiving sets in each *zail*.

45,728. You mention a mechanical crop estimator for crop-cutting experiments. At present, that work is done by the Revenue Department, and they classify the crop as being 4 annas, 8 annas, 12 annas or whatever it may be. You do not want the human element to come in; you want this done by a mechanical estimator. Will you amplify that a little?—It will be a sort of reaping machine which will go through a field and cut a strip in front of it, take the cut grain back, thresh it and weigh it.

45,729. *Professor Gangulee*: These implements are used only for crop-cutting experiments?—Yes, purely for estimating purposes.

45,730. *Mr. Kamat*: For the use of this sort of estimating machine, you presuppose there will be a very long stretch of furrow, and that in each village the greater part of the cultivated area will consist of one crop; otherwise your estimating machine will not work?—This is to estimate one particular crop. You would not want a very big area for it.

45,731. In provinces where fragmentation of land has gone very far and there is a variety of crops within the same village would a mechanical estimating machine be of any value?—Not in small fields of an acre or less. It would be of use in a field 200 to 300 feet long.

45,732. In other words, such a machine would be more suitable in the Punjab than in other provinces, where fragmentation has gone very far?—Yes.

45,733. You say that standardisation of ploughs and other implements should preferably be done by the Central Government?—Yes.

45,734. You also say in another place that co-operation between the agriculturist and the engineer is necessary to evolve a suitable type of plough or other implement?—Yes; the standardisation of types.

45,735. If the Central Government were to undertake the work of standardisation, is it your idea that they would call together agriculturists from your own and other provinces, and agricultural engineers, with a view to finding out suitable types for the different provinces?—If this is done by the Central Government what they will do is to carry out the work in two or three places in the province.

45,736. You mean that experiments should be carried out in your province by the Central Government?—The Central Government would be in charge of this particular line of investigation. The investigation would be carried out in each province by an officer working under the Central Government.

45,737. It comes to this, that representatives of the Central Government would come to each province and, with the co-operation of your agricultural officers, carry out these investigations?—Yes, or the province may depute an engineer to work under the Central Government.

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45,738. Have you considered whether there might not be a difficulty in view of the fact that agriculture is a transferred subject?—I do not think there would be.

45,739. The second difficulty in the way of standardisation would be the various types of implement which in a vast country like India would be required for the different kinds of soil and other conditions met with, would it not? Have you visited other provinces?—I have. I do not think the number of types will be so great as one might imagine. If the matter were investigated, I think we could reduce it to three or four types for the Punjab, and I do not see why that should not be done in other provinces also. Certain of the types which suit the Punjab would suit other provinces.

45,740. Taking the plough as an example, you think in the Punjab you would not require more than three or four types of plough?—Three or four types would cover our requirements.

45,741. Would those few types cover the requirements, of, say, Madras or Bengal, where a small plough suitable for very small bullocks is necessary?—We have a small plough for small bullocks in one part of the Punjab as well, and it is possible a plough which would suit that area of the Punjab would also suit Madras. That is why I say this work should be carried out under the Central Government.

45,742. I am trying to find out whether the number of types which will be required will be small or large?—For the whole of India, I consider the number will be small.

45,743. *Mr. Roberts*: Do you regard the present position, when practically all the students of this college go into Government service, as a healthy one?—Yes. They are trained here for the good of the agriculture of the province, and whether they are working for Government or for themselves they are working for the good of the agriculture of the province. I think as Government servants at the present time they are doing more good to the province as a whole than they possibly could do if they were working for themselves.

45,744. In connection with the hydraulic experimental station, is it your idea that its work should be confined to measuring only the water-requirements of crops under present conditions, or do you consider that the study of different systems of farming should be undertaken?—I would certainly combine it with studying the different systems of irrigating, that is to say, the different types of modules, &c. That could be done without affecting the value of the experiments with regard to the quantity of water. I consider that experiments regarding the quantity of water required by crops is of fundamental importance.

45,745. An agriculturist as well as an engineer is required?—Yes, undoubtedly.

45,746. If a different system of farming is introduced, there will be certain changes in the soil which would require study by other experts?—Yes, a soil physicist.

45,747. So that you would also press for that?—The soil physicist would probably be able to take up that work in addition to his other work, say, at the research institution here; he could have the station at Lyallpur. I do not say that you require a soil physicist on the spot, but I think you do require a whole-time engineer and a whole-time agriculturist on experimental work of that type.

45,748. You are not quite so sure about the soil physicist?—I do not know the amount of work that has to be done in that respect, but I do know the amount of work that is required to be done by the engineer and the agriculturist.

45,749. *Sir Ganga Ram*: That is because you are an engineer yourself?—Yes.

45,750. *Mr. Roberts*: With regard to crop cutting, is it not a fact that you can now get, with reference to very large areas in the province, definite information about crop yields from zamindars?—Yes, we can, after the crops are harvested.

45,751. Then why are these crop cutting experiments necessary in many parts?—I am afraid I cannot tell you; as I say, the matter was brought to my notice by a former Director of Agriculture who required a machine for this purpose because he considered the present method of estimating growing crops to be inaccurate, and I say we can produce a machine for the purpose.

45,752. On page 712, you compare the price of an implement made by you here with a quotation from Home; is not it a fact that these large manufacturers as a rule strongly object to making a small number like that?—Yes.

45,753. Would not that be reflected in the quotation?—Possibly, yes, if it is merely a matter of making two or three hundreds.

45,754. What is the nearest implement to this one?—The horse hoe cultivator.

45,755. What is the price of the American implement?—We obtain Indian ones at Rs.36, and I think I am right in saying that the price of the American Planet Junior hoes landed here was very nearly double.

45,756. *Sir Henry Lawrence*: I am not quite clear from your answers on page 710 whether you are in favour of or opposed to the proposal to raise the entrance qualification of students?—I should like to see the standard higher than it is at present, but I do not wish it to cost the student any more for his education.

45,757. Cannot that proviso be met in any way?—That is under investigation at the present moment; I hope it will be met. I do not think it would be met by making the entrance examination, say, equal to the present F.Sc. stage, the intermediate standard, because they will be required to give at least three years, and that would mean that the whole of the education then would be five years instead of the four years at present.

45,758. Your object is to ensure that sons of agriculturists will not be kept out by higher entrance standards?—Yes.

45,759. Would it be reasonable to ask the Government to pay the expense of the fifth year which would be thus imposed?—I think it would be necessary.

45,760. What would be the cost to Government of that?—That brings us back to the cost of education; we should have to go into that; but I think it could be met by scholarships such as we have at present.

45,761. All students in the last year to receive a scholarship?—I think that might be possible.

45,762. How many students have you at the present time?—In our fourth year at the present time there are approximately 42.

45,763. The cost to the student of the education is about Rs.600 a year, or is it more, including everything?—Yes, about Rs.600, probably not exceeding Rs.600.

The monthly cost to students in the fourth year class is as follows:—

	Rs.	as.	p.	
College fees	12	0	0	per mensem.
Games	0	12	0	,,
Hostel fee	2	10	8	,,
Lighting	0	12	0	,,
Average cost of food	28	0	0	,,
Total	44	2	8	,,

45,764. *Sir Henry Lawrence*: So that this idea of giving them free education for the last year could be met at an expense of Rs.25,000 to the Government?—Yes.

45,765. Would that be a sufficient safeguard for the sons of agriculturists?—For that number of 40, yes, but there will come a time when we shall have to educate more than 40.

45,766. But so far as the sons of agriculturists are concerned, Rs.600 per head per year would be sufficient provision?—Yes, for the last year.

45,767. Do you think that is too great a demand to make on the provincial revenues?—I do not think that is a very heavy demand. It will take an extra year which of course also has to be considered.

45,768. I want you to take everything into consideration?—If it is going to take five years in every other profession, I imagine that the time question would not arise; but the cost of the education should not be more than it is at present, and that can be met by a scholarship of say Rs.600 per head.

45,769. On those terms would you approve of raising the entrance qualification?—If that can be done, yes.

45,770. *Sir Ganga Ram*: You know that in the Punjab there is a medical group taking the F.Sc.; certain necessary subjects are laid down; the Medical Department select boys from that group for admission and then take them for a certain number of years for medical education?—Yes.

45,771. Supposing that system were followed, that there was an agricultural group in the University, and F.Sc. boys passing in the agricultural group were taken at Lyallpur College for three years, would not that meet the point?—Again the period comes to five years.

45,772. It is five years instead of four; that is all?—That is a heavy item. It would produce the graduates, certainly, but, as I say, at additional cost.

45,773. That would reduce your expense?—The expense I have in mind is not the expense to the college.

45,774. Your curriculum at present is four years; that would reduce it to three years?—Yes, but then you are increasing the expense to the student by one year's education.

45,775. That is a different matter; it will be for them to consider that question; but will those boys be as efficient as they would be if they spent five years here?—Yes, I believe we could make them just as efficient in the three years course here if it started at the end of the F.Sc. course.

45,776. A disqualification under which manufacturers of implements labour here which was pointed out to us by a manufacturing firm in Poona is that the raw material which comes to this country is subject to a duty of 30 or 40 per cent.; the manufacturers in England are saved that expense and the product of their manufacturers in England and America is admitted free. Are you aware of that?—Yes, I am aware of that, but I do not think it is a very serious problem with regard to the smaller implements. The duty certainly does not exceed 30 per cent., and that is on the material, while in the manufacture of those implements the chief item is labour.

45,777. I have brought that point to your notice and you might consider it?—Yes.

45,778. When you propose a system of pumping with a battery of wells, what power do you contemplate, steam, oil or what?—At the present moment we are investigating steam and oil.

45,779. How do you convey the power? By compressed air or electricity?—We are considering those two systems of distribution, compressed air and electricity.

45,780. You are experimenting on both systems?—We are not experimenting, but we are comparing them now for estimating purposes.

45,781. You have not formed any definite conclusion on that matter?—No.

45,782. Before you advise anybody to go in for tube wells, do you take a section of the ground with a view to finding out what the subsoil contains?—In a district we do not know we do make a trial boring.

45,783. In a district, the soil may vary from one place to another; have you arrived at any formula by which you can say that given a certain depth of coarse sand, it will give so many cusecs?—Yes, we know the quality of the sand, and if we have had one or two borings in a district, then in that neighbourhood we can give an estimate with considerable confidence that we shall be correct. If we do not know the district, we make a trial boring.

45,784. You said that the cost of boring comes to Rs.3 per foot?—In the small sizes, yes; in the large ones it comes to as much as Rs.7—8—0.

45,785. A gang that I left in Patiala are doing it for 8 annas a foot at 6 ins.?—But my estimate includes the pipe.

45,786. My figure also includes the pipe; I mean ordinary sheet iron pipes riveted together. Are you aware of the Japanese system of boring with bamboo?—The Kazusa system, yes; I know it.

45,787. Have you tried that?—No, I have not tried it.

45,788. Can you give us a list of agricultural problems which require research, differentiating them between All-India problems and provincial problems? Have you thought of this?—No, I have not.

45,789. Could you think of those and send us a note?—As far as my own section is concerned.

45,790. Because some problems may be common to all provinces?—We have no problems of that sort in the Engineering Section at present, nor have any arisen so far.

45,791. I am speaking of agricultural problems?—I am dealing with the Engineering Section.

45,792. What course of engineering do you give in your college here?—We give four periods a week to the students.

45,793. What do you teach them?—Civil engineering as applied to agriculture.

45,794. And a little mechanics also?—Yes, a certain amount.

45,795. Are you preparing any lists of the delta of water required for crops? Have you seen the latest investigations made by the Irrigation Department in the Punjab?—No, I have not got that yet.

45,796. If you do so, you must take into consideration the rainfall, otherwise it will be of little value?—With regard to tube wells we do take into consideration the rainfall of the district in calculating the number of days' pumping that is required in the year.

45,797. *Sir Thomas Middleton*: On page 715 of your memorandum, you say: "To keep the masses on the land I do not consider that education in rural areas should be carried beyond the elementary stage." You are referring to general education?—Yes.

45,798. The number of pupils proceeding to an institution like Lyallpur is very small indeed as compared with the number of agriculturists in the Punjab?—Quite.

45,799. What is to be done for the technical instruction of the masses who do not proceed beyond the elementary stage?—They could take a six months vernacular course.

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45,800. What number of six months' courses are being provided at present?—One at present; this year we are starting two, and we shall have two from now onwards.

45,801. These courses are general courses?—Yes.

45,802. Is anything being done in the way of providing technical courses in special subjects for the agriculturist, as, for example, a course on sugar-growing and the manufacture of *gur*?—We have not taken up sugar-growing or *gur* in the Punjab.

45,803. Or any one special subject?—Yes, we have a six weeks course going on at the present moment for *lohars*, village blacksmiths, on oil-engine running, repairs to implements, and so on.

45,804. Do you think a great deal could be done for the technical education of the masses by expanding this short course system of education?—Yes, I do. I am in favour of short courses of instruction in special subjects.

45,805. What age of students do you like to get to these short courses?—They come in at various ages just now; some of them are quite boys of 14 and 15, and some are older men over 20.

45,806. Generally speaking, would they be men of 20 to 23?—That is about the age, yes.

45,807. With regard to your college students, what are the favourite subjects taken by students who go up for the M.Sc. from Lyallpur?—Botany has claimed most of the men.

45,808. How many have gone up in engineering subjects?—For 1924 up to now we have had six students who have taken up engineering.

45,809. From the M.Sc.?—No, after leaving this college they have gone to Europe and studied engineering.

45,810. I was thinking just now of the M.Sc. of your Lahore University?—Botany has claimed most of them.

45,811. Then if we take advanced courses generally, you have had six go up in engineering?—Yes.

45,812. What other subjects besides botany and engineering have been taken?—Entomology: in 1925 one student only studied for one year and then withdrew from the class; he took up Government employment.

45,813. Reference has been made to raising the entrance standard to the F.Sc.; would that mean that the period of residence at this college would be curtailed to three years?—Yes, I take it it would be.

45,814. Would that also mean that the chances of the student getting the practical instruction which you can give in agriculture in this college would be reduced?—Very slightly. We have investigated that question to a certain extent, and I think it would be possible to prepare a course in which he would get first class training in the three years, provided he came here at the F.Sc. stage.

45,815. I think you will agree that one of the great difficulties one is faced with here is that of getting practical instruction for the young graduates?—We do not have difficulty in regard to practical instruction.

45,816. I should rather have said: is the young graduate getting practical experience? That is the great difficulty?—Yes.

45,817. Has any attempt been made to place young graduates on some of these large farms that you have in the Punjab?—There is a scheme of that kind under consideration at the present time; the proposal has been sent up by the Director of Agriculture and it is before Government now; the proposal is to put the graduates of the college here on to an area of land over a period of say five years.

45,818. That is for putting them on an area of land for which they will themselves be responsible?—Yes, they are responsible for it; they would work under the supervision of the department.

45,819. I was thinking of placing them out as apprentices on large farms where they would see the organisation of work on a large scale and also see improved methods?—I think that would be difficult with graduates in this country at the present time.

45,820. You know that the practice is relatively common in other countries, for young graduates to go and get experience?—That forms part of their education in agriculture.

45,821. On page 714 of your memorandum you refer to the subject of implements; there seem to be two types of problem in front of you there; first there is the question of improving the design and construction of the local implement. For example, I have seen in the Punjab implements the idea of which was borrowed from Bombay, but these implements seem to me to be better constructed and manufactured than those which I have seen in use in the Bombay Presidency. That type of improvement in local design, you will of course agree, is easily made by a skilled engineer?—Yes, very often.

45,822. But there is another type of work referred to in your memorandum; that is the designing of machines or implements which would be suitable for mass production?—Suitable for cultivation in the first place.

45,823. Yes, suitable for cultivation and also suitable for mass production? —Any machine or implement is suitable for mass production if the numbers are required.

45,824. That brings me back to the point that has already been raised: if we are to secure mass production, we must reduce our types, for example, of the plough?—Yes.

45,825. You were questioned as to the number which you consider would be necessary for the Punjab?—Yes.

45,826. A previous witness whom we questioned on the point expressed the view that for all India possibly as small a number as eight types of plough might be suitable; have you any view on that?—I have not considered it from an All-India point of view, but I think we could reduce it in the Punjab to three or four types; but even then, with four types, that would mean producing an enormous number of implements.

45,827. You will recognise, I think, that the main obstacle in dealing with these implements that are being made by mass production is not the production but the difficulty of getting people to adopt them?—I do not think so; I think if you give the cultivator a suitable implement he will use it and be only to glad to use it.

45,828. But even in regard to the plough, which is an implement that has had long study and is well designed, the cultivator is very particular in his requirements?—Yes, because I do not think we have yet produced the right type of plough; I think we have more work to do on the plough than on any other implement.

45,829. In evidence I think you said that the work which was required for the improvement of implements must necessarily take a very long time? —Yes.

45,830. You are basing that conclusion on experience in other countries in the attempts which have been made to design such implements as the plough, for example?—No, I do not know what time has been taken in designing the implements as they stand; I am basing it on experience of the results we have already obtained; it requires a great deal of investigation, trial and testing and making of types before one can arrive at a suitable type.

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45,831. But in fact a great deal of time and attention has been given, not only by engineers but by skilled mathematicians, to the design of the plough?—Yes, but I do not think to the same extent in India as in Western countries.

45,832. I was not thinking of India?—In Western countries it has been done, but conditions here are very different.

45,833. You mention the reclamation of salt land at Narwala by washing; what is the cost of that process? Is it an expensive method of reclamation?—I do not know the cost; I can probably get the details; that work was in progress when I came to the department and it struck me as having a wonderful effect; other methods were tried.

45,834. Could you say whether generally it was regarded as a successful experiment, or otherwise?—The different methods were tried and it amounted to this, that deep cultivation and copious irrigation allowed that area to be cultivated, whereas it had not been cultivated before. Reclamation on these lines is not expensive; that is my point; but the experimental work which led to the conclusion that this treatment was sufficient was naturally expensive.

45,835. *Mr. Barron*: One witness told the Commission that he thought all Indian Civilians and magistrates generally should be put through a course of public health; something of that sort is done, is it not, in regard to agriculture?—We give a course of one month which we term the Rural Economy Course to members of the Civil Service, Assistant Commissioners, Extra Assistant Commissioners, members of the Irrigation Department Assistant Engineers, and so on.

45,836. Is the course going on at the present moment?—Yes, it finishes on the 20th of this month.

45,837. How many Assistant Commissioners or Extra Assistant Commissioners have you in it?—We have six Assistant Commissioners and six Extra Assistant Commissioners.

45,838. You were asked if you could give the cost to Government of a graduate from this college, but you were not able to do so?—I cannot do that, because, as I say, it is extremely difficult to separate research from instruction.

45,839. In the report of the Education Department, the figure of Rs.1,08,000 odd is given as the cost last year of this college as a professional college; did you supply that figure to the Education Department?—I did not.

45,840. The Education Department said you or the Department of Agriculture had; but if there is such a figure in that report, is it worth anything at all? Can any deduction be drawn from it as to the cost of a graduate?— No, I should say not. A former Minister asked us to try and estimate the cost, and our difficulty was in apportioning time and cost between teaching and research; then he asked us to assume a division of time and cost between teaching and research; we were faced with very great difficulties, and could not arrive at what I should call a reliable figure.

45,841. You could not separate out the cost of your purely teaching work from that of all your other activities here?—No; nor could we separate costs of such items as gas and electric power production etc.

45,842. In view of the discussion regarding the amount of time and attention your department has paid to work on *barani* soils, let us take some of the results of the department; is not 8-A wheat a good wheat for *barani* land?—I cannot give an opinion on that.

45,843. Perhaps you can give an opinion as to whether a bar harrow is a good implement for conserving moisture on *barani* land?—Yes, it is.

45,844. Is it not a fact that the general principles of conserving moisture in soils are taught in this college, and therefore the knowledge acquired here is of use on *barani* as well as irrigated land?—Yes, that is so.

45,845. Do you know the Gurdaspur farm?—Yes.

45,846. Is that irrigated or unirrigated?—They have a tube well there; part of it is *barani*.

45,847. One hundred acres of it is unirrigated, is it not?—Yes.

45,848. It depends entirely on rainfall?—Yes.

45,849. So that the work you do there is work on *barani* land?—That is so.

45,850. When you are depending merely on rainfall, the conditions vary very much from year to year, do they not?—Quite, depending on the rainfall.

45,851. Working under such conditions, could you have drawn any definite conclusions very quickly?—I am afraid I have not gone into that.

45,852. It is not really your subject. With regard to the question as to whether demonstration should be carried out on farmers' own lands or on demonstration farms, would you say that both systems have their merits?—Yes, undoubtedly.

45,853. Is it not a fact that you can, for example, maintain continuity of work on your own farm and can arrange conditions in a way in which a farmer may not be always willing to allow you to do on his farm?—Yes, that is the point.

45,854. It also may be the fact that on your own farm you can carry out demonstrations at a time that would not always suit the farmer?—Quite.

45,855. So that both systems are necessary?—Yes, they are.

45,855A. This morning the Commission saw your dairy. It has been suggested that there are no facilities in the Punjab for giving the staff of the Co-operative Department training in the taking of milk records, dairying or animal nutrition. Do you agree that no training of that sort can be given here?—No, I disagree; we have the facilities and we do give training in dairying here.

45,856. To men of the Co-operative Department?—No, I do not think we have had men of the Co-operative Department actually taking a dairying course.

45,857. But you could teach them to become milk recorders and so forth?—Yes.

45,858. And you could teach them a good deal that would be useful to them in cattle breeding societies?—Quite; all that instruction is given here to students at the college.

45,859. *Sir Ganga Ram*: You said that you are admitting students from other provinces; how many students have you now from other provinces?

45,860. *Mr. Barron*: From other provinces and Indian States nine out of 49 were admitted last year.

45,861. *Sir Ganga Ram*. In view of the fact that they have colleges of their own, why do they come here; is it because they feel that they receive superior education here?—I have myself asked applicants that question, and have been told that they think the training is better at Lyallpur than it is elsewhere.

45,862. Is it because their parents live here?—No, their parents live in other provinces.

45,863. Then are we charging them for their education?—Yes, we are.

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45,864. How much are we charging?—They are paying the ordinary fees plus a small addition for students from outside provinces.

45,865. Is the Government getting any benefit from it?—Yes.

45,866. I ask this question because the Punjab Government is charged Rs.10,000 per head for Punjabi students going to Roorkee in the United Provinces; you are not charging anything like that?—No, nothing of that sort.

45,867. Have you made any investigations as to any tree that will not throw an injurious shade on crops?—No, I have not.

45,868. *Mr. Barron*: With regard to that last question, I have always understood that it is the amount of water that the trees extract from the soil that does harm to the crops, rather than the shade?—Yes, I believe it is; but that is not a question that I have taken up; the point that interests me there is the fact that crops do not grow so well in the neighbourhood of trees.

45,869. Possibly that is owing to the subtraction of moisture required by the tree?—Yes, moisture extracted from the soil and shade.

45,870. *Sir Henry Lawrence*: One gentleman has written to this Commission to say that this institution is of no value to the Mahommedans of the Punjab; is that correct?—Every year a large proportion of our students is Mahommedan, and they get the same training as the Hindus and Sikhs.

45,871. Can you tell us what the proportion of Mahommedans is?—I can get those figures for you; as far as I remember, it is approximately 50 per cent. Mahommedans, 25 per cent. Hindus, and 25 per cent. Sikhs.

45,872. Could you verify those figures and let us know?—Yes. Of the students admitted to the college in May last the proportion is as follows:—

Hindus	27 per cent.
Sikhs	35 ,,
Mahommedans	38 ,,

We arrived at a proportion of—

Hindus	25 per cent.
Sikhs	25 ,,
Mahommedans	50 ,,

but the standard of intelligence of the Sikh applicants was higher than that of the Mahommedan applicants, and the proportion of Sikh applicants was also higher than the proportion of admissions as given.

45,873 *Professor Gangulee*: Are you using dynamometer tests in designing your farming implements?—Yes, we have very recently obtained a recording dynamometer which we are putting into operation; formerly we used the spring balance type, which is not sufficiently accurate.

45,874. You have no Soil Physicist in this college?—No.

45,875. If a Soil Physicist worked in co-operation with the Agricultural Engineer, you could get better results?—I do not think a Soil Physicist is so necessary as a professional agriculturist.

45,876. Am I right in thinking that there is a growing demand for farm implements?—Yes.

45,877. The cultivators have taken to them and are anxious to get them?—Yes.

45,878. What agencies have you for the distribution and sale of implements?—Every Deputy Director of Agriculture sells implements.

45,879. Are they distributed through co-operative societies?—The Co-operative Department will take implements. Are you referring to those made here or those imported from abroad?

45,880. To those manufactured here?—Those are not supplied to Deputy Directors unless there is a demand for them. If there were any demand for them in the district the Deputy Director would be supplied with them.

45,881. Are the implements manufactured here sold only by the Department of Agriculture and not by co-operative societies?—I do not think co-operative societies have ever asked for those implements. If they wanted them we could manufacture them and let them have them.

(The witness withdrew.)

KHAN BAHADUR SAYAD Sir MEHDI SHAH, K.C.I.E., O.B.E., Gojra, Punjab.

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION.—(i) No.

(ii) In Lyallpur district, agricultural education should be provided in every village school.

(iii) Yes.

(iv) Yes.

(v) If agriculture is made profitable.

(vi) Yes.

(vii) Teach the use of Raja and Meston ploughs, harrows, and the automatic drilling of wheat and cotton.

(viii) This is not enough.

(ix) No work. They read for service which cannot be had.

(x) To make extensive use of experimental farms, so that such lads may have a liking for agriculture.

(xi) Nil.

(xii) If they can profit in any way.

(xiii) The Agricultural Department should in every village take one or two squares on lease, and there make experiments, so that agriculturists in rural areas may see the experiments and make better use of their own lands. Thus agriculture is sure to improve. This system should be introduced in the colonies only.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—In this district, a few agricultural societies have been formed, to demonstrate and do propaganda work, which are quite useless as they are not doing any work. I would suggest that the Agricultural Department should engage trained men in some villages in the rural areas, so that these men may lecture to the agriculturists and teach them the use of different machines and fertilizers, etc., as these rural agriculturists do not ever care to go to the Agriculture College at Lyallpur. These men will also teach them the benefits of the rotation of different crops. In my opinion, this will greatly help towards better education in practical agriculture. These men in rural areas can easily see to the pests and diseases of the crops, and take immediate steps to check and remove them.

QUESTION 4.—ADMINISTRATION.—(*a*) The Government of India may usefully supplement the activities of the Local Governments, who should make use of the services of non-official influential men in each *ilaqa*.

(*c*) Metalled roads are a great necessity for agriculturists.

Posts and telegraphs should be increased, in the colonies specially.

QUESTION 5.—FINANCE.—The *taccavi* rules are rather hard; these should be made more favourable, and long term should be allowed for repayment, with a very nominal interest.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) Necessity; there is not enough income from agriculture.

(ii) Shopkeepers of villages and markets.

(*b*) On account of failure of crops the agriculturists generally get into debt, which, on account of their other regular expenses, they are unable to clear. The loans or *taccavi* should be given to them, either without or at very nominal interest; in case they are very heavily indebted, their lands should be put under Government control to pay off the debts from the income, and they may be given regular expenses for the necessities of life.

QUESTION 8.—IRRIGATION.—(*a*) In the following districts improvements can be made in agriculture by making tanks and wells: Campbellpur district, Pindigheb *tehsil*; Rawalpindi district, Pindi and Gujar Khan *tehsils*, Jhelum district; Mianwali district, by non-perennial canals.

QUESTION 10.—FERTILISERS.—In my experience of agriculture, I have noticed that sheep and goat manure is the best. Lands that have not been yielding any crops have been fertilised by this manure. The agriculturists keep their herds of goats and sheep in their fields for some days and their manure is left in those plots and they are much better then. But in some villages it is rather difficult to maintain these herds as there are no grazing grounds.

(*f*) The villagers find it difficult to obtain fuel wood, hence they are obliged to use cow dung as fuel. If the Canal Department would sell fuel wood at very cheap rates, I am sure people would stop using cow dung as fuel.

QUESTION 14.—IMPLEMENTS.—The new agricultural implements and machinery are good, but they are not much used as, when they get out of order, there is a want of facilities in rural areas to repair them. Their prices are also rather high.

QUESTION 15.—VETERINARY.—(*a*) This department should be under the Director of Agriculture.

(*b*) (i) In this district, the dispensaries are under the control of the District Board and I think this system works quite well.

(ii) Yes.

(iii) No. This should be under the control of District Boards.

(*c*) (i) The agriculturists have now learnt the use of these dispensaries and make full use of them.

(ii) Touring dispensaries are not required.

(*d*) In my opinion compulsory inoculation for contagious diseases is necessary, as the agriculturists do not voluntarily make use of it and thus contagious diseases spread.

(*e*) Sometimes there is difficulty in securing serum.

(*f*) No fees are charged for inoculation, but the agriculturists have not yet learnt the benefit of the inoculation.

(*g*) The provision of further facilities for research into animal diseases is desirable, but this should take the form of a Provincial Research Institution.

QUESTION 16.—ANIMAL HUSBANDRY.—Government should arrange to provide well-bred bulls; this will improve the breeds of the live stock and also the dairy industry.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—It is very necessary that Government should do much more to establish rural industries connected with the preparation of agricultural produce and there is a vast field for this in this Province, and specially in the Colony districts. This will provide subsidiary employment for the rural population.

QUESTION 18.—AGRICULTURAL LABOUR.—In my opinion, there is no surplus agricultural labour, as the industrial institutions pay high wages, and so the agriculturists even in these parts cannot get enough labourers.

Oral Evidence.

45,882. *The Chairman*: Khan Bahadur Sayad Sir Mehdi Shah, you have provided us with a note of your evidence. Is there anything you would like to add to that at this stage?—No.

45,883. You say that, in the Lyallpur district, agricultural education should be provided in every school. What class of agricultural education are you thinking of?—Any kind of education which is agricultural.

45,884. You would have that even in the primary schools?—Yes.

45,885. Do you mean that primary school children should be taught farming?—Yes.

45,886. Do you not think they are better engaged in learning to read and write?—It may be said that I am against education, but I do not think that after five or six years they will learn very much; they will go back to their homes.

45,887. In answer to our Question 2 (viii), where we ask you for your views on nature study, school plots and school farms, you are a little hard on us, because you say "This is not enough". Do you mean that nature study, school plots and school farms do not provide a sufficiently comprehensive system of agricultural education in schools?—Yes.

45,888. Further on, you make the suggestion that the Agricultural Department should in every village take one or two squares on lease and there make experiments, so that agriculturists in rural areas may see those experiments and make better use of their own land. Then you say that this should be done only in the canal colonies. Do you live in the canal colonies?—Yes.

45,889. Why do you want to deny this boon to those who do not happen to live there?—I have not given thought to the matter. I am only dealing with the canal colonies here.

45,890. Are you a farmer yourself?—Yes.

45,891. Do you farm your own land?—Yes.

45,892. You farm directly by means of hired labour?—Yes.

45,893. Do you let any of your land on lease?—Yes.

45,894. How many acres do you possess?—About 40 squares.

45,895. How many do you farm yourself?—Two squares.

45,896. So that you have 38 squares let out. Is that on *batai*?—Yes.

45,897. Have you co-operative societies in your district?—Yes.

45,898. Where do your tenants get their money from? Do they borrow from you at all?—No, from the societies.

45,899. They do not attempt to borrow from you?—No.

45,900. Do you lend them seed?—Sometimes, in the case of special seed, such as some special cotton seed, I have my own seed, which is better than can be obtained elsewhere.

45,901. You like your own seed best?—I think it is the best.

45,902. Where did you get that seed from?—I chose it myself by selection.

45,903. You put that seed out on your tenants' land as well as on the land you farm yourself?—Yes. I give them seed, and when the crop is ready, they give me the price for it.

45,904. In seed?—Sometimes in seed and sometimes in cash.

45,905. What arrangement have you got with them? Do they give you back 1½ times as much seed as you give them?—No, they give me the same quantity again. I do not take anything extra from my tenants.

45,906. I see from your answer to our Question 3 that you are not satisfied with the societies which have been formed to do demonstration and propaganda work?—That is so.

45,907. Are they doing no good, in your view?—There is not enough of them, so that they are unable to have much effect.

45,908. You suggest that special men should be engaged to do demonstration farming. Has not the Agricultural Department got demonstrators at work in your district?—A man may come round for an hour or two every three or six months, but that is not enough; they should live there among the people.

45,909. You want resident demonstrators?—Yes.

45,910. You suggest, in answer to Question 5, that *taccavi* rules are rather hard. In what respect?—It is very hard to get the money. There are various difficulties in the way.

45,911. Difficulties in getting the loan granted or difficulties in getting the whole of it into the cultivator's pocket?—Both.

45,912. You no doubt realise that Government, in lending the taxpayers' money, must needs see that repayment is punctual?—Yes.

45,913. What is your impression of the effect that the co-operative credit movement has had on the position of the cultivator? Has it been beneficial?—Yes, but the co-operative societies have not sufficient money to lend to the farmers; they only lend small sums, and the money they do lend goes to the moneylenders, to whom the farmers owe money. The farmer is therefore left in the same position as before and has to borrow from the moneylender again, and sometimes the moneylender will not let him have a loan and he becomes very hard up. People are not so keen on co-operative societies as they used to be, because the societies have not enough money to lend them.

45,914. Are there any signs of that, such as decrease in the number of societies?—No, because the people are afraid of the officers. The societies are only nominal in many cases, because no business is done.

45,915. They dare not take their names off the books for fear the officers of the Co-operative Department should talk to them: is that right?—Yes.

45,916. Are you a member of a co-operative society?—Yes.

45,917. On page 741 of your note, you say that veterinary dispensaries are under the control of District Boards in this part of the world, and that you think this system works quite well. Are you on the District Board yourself?—Yes.

45,918. Does the District Board take an interest in veterinary work?—Yes.

45,919. Is the cultivator coming more and more to regard the veterinary officers as his advisers in these matters?—Yes.

45,920. You say that sometimes there is difficulty in securing serum. Are you thinking of serum for rinderpest?—Yes. On one occasion it took six or seven days to get it, even after telegrams had been sent. By then a number of the cattle had died.

45,921. In answer to our Question 17 you suggest Government should establish rural industries connected with the preparation of agricultural produce, and you say there is a vast field for this in this province, and especially in the canal colony districts?—There are *mandis* all over the colonies, and in these *mandis* there should be shops where ploughs could be repaired. It is difficult at present for the people to get experts to repair their ploughs. There should be factories for the purpose. When implements recommended by the department are taken to the villages they break, and the blacksmiths in the villages cannot mend them.

45,922. *Sir Ganga Ram*: It has been represented to us that when zamindars take *taccavi* from Government the whole of that money does not reach the zamindar. Is that right?—Quite right.

45,923. And does it take too much time to get the loan?—That does not matter so much.

45,924. *Sir Thomas Middleton*: Have you been well satisfied with the knowledge and experience of the agricultural demonstrators whom you have met?—Yes, but there are too few of them. There are more than 10 lakhs of zamindars here and the few demonstrators available are not enough.

45,925. How many would you like to see in each tahsil?—I do not know how many, but there are, as I say, 10 lakhs of zamindars here. I think there should be one in each *zail*.

45,926. *Mr. Barron*: Gojra is not your original home?—No, my home is in Campbellpur, in the Attock district.

45,927. Did you come to this Colony when it started?—I came here in 1898.

45,928. Did you buy these squares you now have?—I got them from Government on the original conditions, on *nazrana* terms.

45,929. How many squares did you get?—21.

45,930. *Sir Henry Lawrence*: At what price?

45,931. *Mr. Barron*: On *nazrana* terms?—Rs.20,000 to Rs.22,000.

45,932. *Sir Henry Lawrence*: Rs.1,000 a square?—Yes.

45,933. *Mr. Barron*: Land was cheap in those days. After that you bought the remaining squares which you hold?—I got them on camel-breeding conditions and paid Rs.4,000 a square.

45,934. *Sir James MacKenna*: Were you not a railway contractor at one time? Did you not build a railway?—Yes. I built the Nushki extension only a few years ago, and before that a line Sindh-Pishin in the Quetta district. I also built a line near Campbellpur (Mari-Attock) and also N.W. Ry. from Lawrencepur to Attock.

45,935. You are also interested in the cotton business?—Yes, I have my factory here.

45,936. You will remember that the Indian Cotton Committee came to Gojra, and I met you then. Has any improvement in the cotton trade followed the results of that Committee's recommendations in regard to watering, the mixing of cotton and so forth?—It depends on the individual. Those who have good cotton do not mix it; those who have not, do.

45,937. You do not think the Cotton Committee has been of much good in these matters?—It has not done any good.

45,938. *Professor Gangulee*: Has cotton research been of benefit to the cotton trade? Has it been of assistance in the provision of better varieties, long-staple cotton and so on?—It has not done any good here. There is no pure cotton here; everyone mixes it. There may be some improvement in the future.

45,939. On page 740, you say rural agriculturists do not care to go to the Agricultural College at Lyallpur. Why?—They are poor people and have not sufficient money. They have to pay for their fares and for their food, and they cannot afford it.

45,940. You say there is not enough income to be had from agriculture. Have you noticed any improvement in the agricultural income of the people during the time you have known this district?—On the Chenab canal there has been a reduction in the amount of water, and unless that is stopped there will be no increased income.

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45,941. You have not noticed any distinct improvement in the income derived from agriculture in this part of the country?—The truth is that it is less than it used to be. People do not get as much water as they used to.

45,942. That has affected the agricultural income?—Yes.

45,943. Has the standard of living been lowered?—Some people live quite well, but others, if they have an evening meal cannot, have a meal in the morning.

45,943A. That is in the canal colonies?—Yes.

45,944. *Mr. Calvert*: Do you think the cultivators of Lyallpur are more prosperous or less prosperous than the cultivators in the Attock district?—I examined a large number of account-books here, and I found that nearly everyone had a debt against him of Rs.4,000 or Rs.5,000. One reason for that is that people have increased their expenditure.

45,946. *Sir Henry Lawrence*: Are you speaking of Lyallpur or Attock?—Of Gojra Ilaqa. Gojra is in the Lyallpur district.

45,946. *Mr. Calvert*: Have they no gold ornaments saved up?—They had gold ornaments, but they have had to sell them. If anyone has gold ornaments he has a debt to the same amount.

45,947. Do you know that co-operative societies lent 17 lakhs to cultivators in the Lyallpur district last year?—The co-operative societies did lend money, but the people owed this money to the moneylenders, and the money was not even enough to enable them to pay off their debts. I started about 80 banks myself, so I know all about them, how they are getting on and what is the result of them.

45,948. Have you tried to improve them?—As I was the originator of those banks I did all I could to improve their condition, but the debt was so heavy that nothing could be done.

45,949. Are you a member of the Provincial Board of Agriculture in Lahore?—Yes.

45,950. Is that any good?—Yes. It has only just started, but in my opinion the results will be satisfactory.

45,951. What was the cost of the District Board hall in Lyallpur?—Two lakhs.

45,952. Was that built out of the money of the poor zamindars?—It was built at the expense of the poor zamindars, but such things are only built once, not every day.

45,953. Do you think anywhere else in India there is a District Board hall which cost two lakhs of rupees?—No. I have seen District Board halls in all the Provinces (Bombay, Madras, the Central Provinces and the United Provinces), but no other District Board has such a good hall.

45,954. Does that not suggest that the cultivators of Lyallpur are the richest in India?—I admit that some people are very rich and that the Colony is the richest in India, but if you make inquiries you will find the people are very deeply in debt.

45,955. *Sir Ganga Ram*: Is not that due to fragmentation? On account of inheritance the holdings have become smaller and smaller?—Yes. Where there was once one man on a square there are now four. In the *mandis*, too, the people are not so well off as they used to be.

45,956. Is not that due to the speculative habits of these *mandi* people?—Yes. In most of these *mandis* they have started companies, and both the company *wallahs* and the *mandi wallahs* are in a bad way.

45,957. Do not the *mandi wallahs* speculate in cotton and grain, and is not their bad state due to speculation?—Yes.

45,958. *Mr. Kamat*: You have given us your experience of co-operative societies. What is your experience of moneylenders?—The moneylenders also have become poor; they have not as much money as they used to have. Originally they used to do business in thousands; now they do it in hundreds.

45,959. Do the villagers depend entirely on co-operative societies wherever they are started, or do they still go to the moneylenders?—They go to both; wherever they can get money they go and take it.

45,960. Would a system of regulating the moneylender's accounts be of help to the villager?—As the moneylenders are always on the look out to cheat the zamindars, the zamindars do not derive much benefit from them. With co-operative societies there is no cheating, but they have not got any money.

45,961. Is the agricultural moneylender in any way better off than the old type of moneylender?—No, worse off.

45,962. Then there is no advantage in creating a new type of agricultural moneylender by artificial means, by legislation?—There can be no law which will be effective, because if an attempt is made to regulate interest, the moneylenders will lend Rs.100 and get a receipt in writing for Rs.200, and accept a lower rate of interest. An Act to regulate interest was contemplated, and I think it is a good thing it was not passed.

45,963. A new class of moneylenders has sprung up under the Land Alienation Act. Are they any better than the old moneylenders?—No.

45,964. Has the Agricultural Department done anything for *barani* land in the Province?—I do not know.

45,965. On the last page of your note, you say something about agricultural industries, and you suggest Government should do much more to establish rural industries. As a business man, will you suggest what industries Government should do something for?—Such industries as we have are small, and we cannot compete with Europe in big industries; therefore we should not start big industries in this country; we should have small industries for those things that are needed by the zamindar.

45,966. *Mr. Kamat*: But are you not prepared to name any particular industry?—Whatever brings in profit should be started.

45,967. *Mr. Roberts*: I believe you took water at volumetric rates at Jaranwala; would you kindly tell us your experience in regard to that?—We did that for three years, but during the three years we did not have any benefit from it.

45,968. In spite of the fact that you had extra water at volumetric rates?—We do not get extra water by the volumetric method.

45,969. *Sir Ganga Ram*: Has the Land Alienation Act improved the credit of the agriculturist for borrowing purposes?—An honest man gets the money even now, but a man who is not honest does not get it.

45,970. Do the grievances of zamindars with regard to water readily get hearing from the Irrigation Department?—Some officers do not attend to grievances for two or three years, while others attend to them at once and the moment the application is made, they redress the grievance. I do not blame the department.

(The witness withdrew.)

The Commission then adjourned till Friday, 11th March, 1927, at 2 p.m.

Khan Bahadur Sayad Sir Mehdi Shah.

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Friday, March 11th, 1927.

LYALLPUR.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman*),

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc. } (*Co-opted Members.*)

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } (*Joint Secretaries.*)

Dr. P. E. LANDER, M.A. (Cantab), D.Sc. (London), A.I.C., Agricultural Chemist, Punjab.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(*a*) (i) In answer to this question, I would refer the Commission to two reports (one small,* one large†) which I have submitted to the Punjab Government on the methods of conducting research under the United States, America, Federal and State Departments of Agriculture, including the administration thereof.

I strongly recommend, that while not strictly following a foreign method, India should develop the organization, administration and financing of agricultural research along the lines indicated in these reports, in so far as they can be adapted to Indian conditions.

(*b*) I refer here specifically in the first instance to the study of human and animal nutrition on which I am personally working (as far as facilities permit), together with systematic and co-ordinated work on the soils and food stuffs produced thereon, in relationship to human and animal welfare. Certain spasmodic work has been done from time to time in India, but no systematic policy or lines of work have ever been attempted to deal with the All-India—or even Provincial aspects of the problem, which is of fundamental importance.

The present state of the Imperial Department of Animal Husbandry and Dairying at Bangalore is ludicrous. The physiological chemist is doing his best with the Laboratory and other facilities under his control, but this institution compares most unfavourably with institutions of its kind abroad. India requires a properly established and equipped Nutrition Department, or better still, two, one in the north and one in the south.

The Commission has seen this establishment at Bangalore and will recognise that it is quite unworthy of India as its main sphere of activity in this line.

(*c*) (i) Connected with and related to the above (*b*) is a co-ordinated scheme of investigation and research into the soils of India, the nutritive value of their produce, and the resultant effects on the population, and again related to this the question of fertilizers.

(ii) More expanded research should be conducted on the problem of increasing the quantity of organic matter in the soils of India.

(iii) With the development of the Fruit Specialist's work in the Punjab, research should be directed into the preservation (and food values) of fruits and vegetables.

India imports thousands of tons of foreign preserved fruits and vegetables. I am aware of an instance in the Punjab where such a development is merely awaiting Government assistance and sanction.

* See page 767.

† See page 756.

(iv) Research into the production of vegetable *ghis* from India, from oil seeds.

India imports thousands of tons of foreign vegetable *ghi*, produced from oil seed exported from her shores.

QUESTION 2.—AGRICULTURAL EDUCATION.—(i) As indicated in (1) (*a*) (i) and 1 (*b*), the number of research institutions is not sufficient.

With regard to teaching colleges, caution should be exercised in extending these, as students after passing through colleges tend to gravitate away from an active participation in agriculture. I would say that the whole of this question opens up considerations of far reaching and fundamental importance. Education in the past has largely tended to defeat its own object, with the result that a large number of discontented, half-educated people have been produced who find it extremely difficult to get employment, because there is not the market for their services, and their "education" has unfitted them for active agricultural labour.

The questions of a general raising of the standard of living, indebtedness, and consolidation of holdings arise, and primary education should be more particularly devoted to the three R's and to enabling the masses to lead a more happy and contented and "economic" life on the soil.

(ii) I would say there is a great necessity for further active propaganda and demonstration work run in conjunction with Government farms.

Zamindars too often look askance on the results obtained on large experimental stations, where all farming factors can be controlled, and they are inclined to say "Yes. You have water in abundance, manures, and money to spend, but we have none of these things." Greater facilities are thus required to bring home to the small man the benefit to be expected by adopting scientific methods.

Often valuable results are obtained on Government experimental farms, but the zamindar has not the means in his grasp to make use of them.

One might suggest that perhaps, utilizing some co-operative system, Government might assist *zamindars* financially to take up and apply to their own lands, methods which have proved to be economically productive on the Government demonstration farms. A great deal of the apathy of small men is no doubt due to the fact that they are continually living on the border-land of poverty with nothing to spare on improvements which, to them, appear to entail a risk, when expenditure is involved.

(iii) Preferably yes, but it does not matter where he is drawn from so long as he has a sympathetic contact with the people, knows his job and is keen.

(iv) Yes, I think they are; at this college there are always plenty of candidates to choose from. The question of an increased demand for instruction is bound up with the whole problem of agricultural economics in India. The *prima facie* object of the existence of agricultural colleges is to produce on the one hand technically qualified men in the various branches of science related to agriculture, and through these men, and also by means of instruction and propaganda to the masses to enable these latter to develop more scientific and remunerative methods of work, which will conduce to a general increase in the standard of living. This leads us to consider:—

(v) Probably one of the main objects of a candidate for admission to an agricultural college is to get a Government or other post, with permanency of tenure, allowing definite recreation and relaxation after duty hours which are not obtainable in agricultural work. This latter is of an exacting nature and produces few distractions under the present conditions of village life. In the majority of cases, the years of study unfit a man (speaking of Indians) for "work" on the land, and he has no, or little inclination to do such work.

I think that greater facilities should be afforded to the zamindars to actually spend some time at demonstration farms and the colleges to learn something about, and see the improved methods carried out under conditions similar to their own and thus to compare results.

Dr. P. E. Lander.

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This would lead to a demand for instruction from the "worker." We want to avoid turning out too many people who have no intention of taking off their coats and doing a job of work. The youth of India want more instruction in the dignity of manual labour..

The chain of events, as it appears to me, in order to stimulate an increased demand for instruction is: consolidation of holdings in economic units; a reduction of indebtedness of the owners; a greater agricultural "bias" in the primary and middle schools, the main object being to keep the boys on the land, so that at the leaving of school age, they will have some idea of the possibilities of agriculture; then a chance of instruction with a strong manual labour bias as above mentioned and a close contact with the demonstration farms, and the district agricultural officers.

These latter should be of a high grade.

(vi) Yes, as far as possible.

(vii) I would say a higher standard for those who will become agricultural officers and specialists at the one end and a wider diffusion of "vernacular instruction" in agriculture at the other. In this connection, agricultural colleges should not give elementary instruction to people who are going on to degrees; this should be done in the schools. Much time has hitherto been wasted in Lyallpur owing to students' defective knowledge of English on entry and the consequent futility of their first year or two of instruction which naturally reflects itself in the latter years.

This is under readjustment at the present time.

(viii) I am in favour of nature study and school plots which, if properly conducted, would enable boys to develop an interest and a bias towards growing things under their own manipulation and would instil some knowledge of fundamental principles. This requires intelligent and trained teachers.

Except possibly in the case of some larger schools, I would not countenance school farms, as the schools should not be turned into embryo agricultural colleges, but a contact might be established with the Government demonstration farms.

(ix) Some find Government posts in the various departments, probably the majority, though I cannot give statistics. Some obtain posts on large farms and estates. A very few do actual work on their own land.

(x) This is referred to somewhat in (iv) and (v); only by proper education and the development of a spirit of responsibility towards the land.

Middle class youths who (or whose fathers) own no land, have little inclination to work on the land, and those who do own land are too prone to let it out to tenants, and not apply their own knowledge, if they have any, to its improvement.

(xi) Yes, courses have been established at Pusa and Bangalore for students who have passed through agricultural colleges.

In the present condition of these institutions, I would prefer to see these men go abroad for their study. I speak in this connection with reference to my own subject, animal nutrition, &c., see my remarks on Bangalore.

Some students also avail themselves of opportunities of proceeding abroad for study, but these are not as numerous as they might be.

QUESTION 4.—ADMINISTRATION.—(*a*) See my report on the United States of America, Departments of Agriculture. I would recommend that we should follow a system, modified to suit India's peculiar needs, on the lines laid down in those reports.

(*b*) This is also covered in those reports. Questions of *All-India* importance such as human and animal nutrition and welfare, fertilisers, the marketing of produce, the control of pests, transport, excise regulations, etc., should be largely controlled and co-ordinated by the Central Governments. Provincial Governments would profit by, and should be glad of, such assistance.

(*c*) (i) The Agricultural Department is young, and considering what it has done, it has grounds for satisfaction and pride. Considering what remains to be, and what could be, done, we must not rest satisfied.

Great caution should be exercised in guarding against any tendency which might lower standards and efficiency, and great efforts should be made to increase them.

QUESTION 9.—SOILS.—(*a*) (i) Speaking for the Punjab, most of the soils met with are deficient in organic matter, and the best type of organic matter that can be employed is farm yard manure, because, not only does this supply actual manurial ingredients but it exerts a vitalising influence which is transmitted to crops grown on soils treated thus, which crops in turn transmit this influence to animals and humans fed thereon. This is a scientifically established fact and this vitalising influence is greater than can be produced by mere artificial fertilisers.

I regard the preservation of organic matter in the soil to be of fundamental importance from a health point of view and enclose a paper* on the subject of the burning of dung which bears thereon.

Soils should therefore be improved by replacing all the organic matter possible. (See also under 10-f.).

The improvement of waterlogged and *kallar* soils is now relegated to the province of engineering, and may be summed up by saying: "Drain the waterlogged soil; open up, flood and drain the *kallar* soils."

(*b*) (i) Certain alkali or *kallar* soils in the Montgomery district, which have been leased by Government on a large scale to capitalists have proved reclaimable by the application of heavy steam cultivation and irrigation perseveringly applied.

Some heavy hard *bara* lands in the same district which were, some ten years ago, absolutely barren have considerably improved, but the treatment they have received renders it problematical whether such lands can be economically reclaimed.

(ii) Some lands lying along the Upper Jhelum Canal near the salt range have preceptibly deteriorated in recent years, and a similar state of things has happened along many other canals, due to seepage, with the result that the land either develops *kallar* or becomes waterlogged.

The question of lining canals, and of draining such waterlogged lands is receiving the attention of Government.

(*c*) Lands which have gone out of cultivation can only be reclaimed by large scale drainage operations on the one hand, with a drainage installation which will prevent a recurrence of the trouble on the other.

Government is already engaged on such operation but with a properly established Soil Bureau under the Central Government, a more thorough investigation of all such lands in India could be undertaken and a co-ordinated policy developed in conjunction with the Provinces. In dealing with reclamation schemes, the economic factor should be kept in view.

QUESTION 10.—FERTILISERS.—(*a*) Yes, decidedly. See also answer to Question 9 (*a*), (i), for farm yard manure.

With regard to the Punjab, the soils are not at present noticeably deficient in phosphorus or potassium and the export of bones is permitted as no serious deficiency has arisen which would bring this question to the front. With intensive cultivation and enormous exports of wheat and other products, the soil must inevitably lose its mineral ingredients in course of time, and it would be a wise precaution to keep all bones in the Province for return to the soil.

Another direction in which improvement is possible is as follows:—

The average Indian cattle are notoriously badly fed. If the oil seed which is exported from the Province could be crushed, and the cake fed

* Not printed.

to the animals, following which the dung be rotted and applied as manure, then both the soil, the crops and eventually the animals and humans would benefit by this preservation cycle.

At present the seed is exported, the cattle are badly fed, the dung is burnt, the soil is depleted and so the vicious cycle goes on.

Here is the improvement then, crush seed, feed the cake to animals, fed the dung to the soils, get improved crops and get improved health.

The oil could be made into vegetable *ghi* and should supplant the imported foreign *ghi* which is made from India's exported oil seeds.

But how are the people going to be induced to feed their cattle better? Only by a continued and strenuous development of education and propaganda.

(*b*) All fertilisers should be sold under standards laid down by the Central Government, and Central and Provincial Governments should be in a position to control such standards of purity and ensure that they are adhered to.

(*c*) A new or improved fertiliser can only be popularised by demonstrating its value. Its value would first be tested under experimental conditions in which it would ultimately be used, following which advertisements in the press supported by the department and the department's own propaganda and activity should do the rest.

Further, it must be remembered with all fertilisers that if a zamindar spends Rs.10 on a fertiliser, he will want more than plus Rs.10 ultimate return.

(*e*) I should say that the effect (using the word "effect" in the widest possible sense) of manuring with phosphates, nitrates, sulphate of ammonia or potash manures has not been sufficiently investigated. The experimental results obtained at Lyallpur from the use of nitrates do not indicate that the results obtained are sufficient to justify their use on economic grounds, except possibly on some types of sugarcane.

The data accumulated from the analyses of Punjab soils show that they are not (generally speaking) deficient in phosphates or potash, although wide variations do occur. Experiments on cane and wheat at Gurdaspur with phosphate and potash manures did not give an economic return.

For cane, ammonium sulphate did give a profitable result.

In dealing with nitrates it is interesting to note that land which has been for a very long time under wheat does not show any appreciable deficiency in total nitrates, due to the natural ability of the soil organisms to fix nitrogen from the air. The vitality of these organisms is greatly enhanced by the presence of organic matter or farm yard manure.

(*f*) First and foremost, provision must be made for a plentiful supply of cheap fuel. I would suggest that the banks of canals be planted with trees for some distance on either side, which could be cut down as required and the canals could be used for transport when necessary. This would also to some degree absorb the seepage water and prevent the percolation of salts to surrounding tracts. Again trees should be grown on every holding sufficiently large to contain them and with consolidation of holdings this should be encouraged so as to ensure men having a supply of fuel handy. With development of road and other transport facilities fuel could also be transported over short distances from forests established for this purpose.

If fuel could thus be provided, and the value of cow dung as a manure be actively demonstrated, the zamindar could possibly be induced to abandon the practice.

QUESTION 16.—ANIMAL HUSBANDRY.—(*b*) (i) The Punjab is notoriously deficient in large natural grazing pastures except in the submontane areas, but I am not aware that any of them are over-stocked.

(ii) These are conspicuous by their absence.

(iv) The shortage of absence of green fodders in dry seasons is likely to affect the general well being of animals particularly when the shortage is reflected also in dry fodders. Green fodders are as necessary for animals as are green leaves, fruit, etc., for man and I would recommend the establishment of large reserves of siloed green fodders in those districts which are likely to experience drought in such quantity as to meet the requirements of the animals in the districts for one year. A reserve would thus always be at hand which could be fed out and restocked every year or two years as the case may be.

Such reserves both of green or dry fodders are a necessary adjunct of good animal husbandry which aims at an improved milk yield.

(v) It is not possible to say at the moment how far deficiencies in the mineral content of fodders and feeding stuffs of the Punjab are responsible for injury to cattle.

A comprehensive investigation into this problem is at present being engaged upon, the method employed being to select soils of widely differing geographical and climatic conditions, etc., and to submit these and the fodders produced thereon to an exhaustive analysis over a period of three years.

I refrain from commenting on the data already obtained and prefer to wait until the piece of work is completed before attempting to draw conclusions.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*d*) *Oil Industry.*—Yes. I think so. I have recently concluded a month's tour of India visiting Oil Mills on behalf of the Punjab Government, the ultimate object being the possible development of this industry in the Punjab. My report is not yet written (January 6th).

I may point out a few general items in this connection:—

(1) Vast quantities of oil seed are exported from India.

(2) Much of this oil is re-imported as foreign manufactured vegetable *ghi*.

(3) The oil cake is lost to India.

(4) Indian cattle are badly fed and require this cake for feeding purposes, and

(5) The land requires the resultant dung.

If therefore Government could establish industries which would keep both the oil and cake in the country for consumption which is badly needed, a great result would have been achieved.

(6) The oil crushing industry of India is poor, inefficient and rather chaotic.

(7) The pivot of the whole problem is "markets." Markets for the oil in India are vast provided a marketable *ghi* can be produced.

Other problems to be considered in connection with this industry are—

(1) Foreign competition,

(2) Excise considerations,

which I shall deal with in my report.

Sugar making.—The establishment of this industry is under the consideration of the Punjab Government at the present time, and is one which calls for development.

QUESTION 19.—FORESTS.—(5) See also my remarks under Question 10 (*f*). Care must be taken when advocating the planting of trees to guard against the damaging of crops.

QUESTION 20.—MARKETING.—(*a*) In this question, I confine my remarks to oil seeds and their products, from observations made during a recent tour of oil mills in India. It would take some months to obtain an accurate

picture of the oil situation but, as far as markets are concerned, these are unsatisfactory, complicated and governed by a large number of factors.

In the first instance, a large proportion of the oil seeds grown in India are exported abroad notably to Marseilles and Holland which have an already established position in the world's markets for the different classes of oil in which they are protected by high tariffs.

Such oil as is produced in India by the mills already in existence finds an almost entirely local market, and little or none is exported.

Adulteration is a characteristic of Indian-produced oils, and while there is an enormous scope for development of this industry in India, it would be some time before India could establish for herself a reputation in the world's markets (in an oil export trade) such as these countries already possess, and which forms such a valuable asset in international trade. There is an enormous market abroad however for Indian oil cake, which cake could profitably be utilised in India itself. In considering internal markets for oil and cakes, it may be said that the country can easily absorb all that it already produces, and in addition, India imports large quantities of foreign vegetable *ghi*, manufactured from her exported oil seeds, upon which a duty of only 15 per cent. is levied. India could thus utilise the oil which is exported provided a satisfactory *ghi* could be produced, and, if the general level of Indian agriculture were raised and animals better fed with even a small quantity of oil cake per head, India ought to be able to utilise a large proportion of the oil cake which now leaves the country.

There is very little market however, for oil cake in India, a point to which I have previously alluded, although one of the crying evils of the country is the under-feeding of the cattle, with consequent reaction on the soil, crops and people.

I consider that the whole question of the oil crushing industry in India and its development is bound up with finding a market for the cake *in India*, and the production of satisfactory *ghi* which would, if produced to a quality comparable with foreign imported *ghi*, find a ready sale.

The cake can only be utilised by educating the people and by propaganda, and by actual demonstration of beneficial results to be obtained, in the same way as any other demonstration of a scientific improvement.

A cake costing 4 or 5 Rs. per maund is not going to be utilised as a manure, but with increased production it should be used as a cattle food and not exported.

(*c*) Yes. All agricultural produce should conform to specifications of quality, purity, etc., laid down and established by the Central and Provincial Governments, as agreed upon under the auspices of a Central Department of Agriculture.

This would enable foreign importers of Indian goods to know that they would get an article of guaranteed quality. The Central Department of Agriculture should exercise strict supervision over all agricultural produce whatsoever exported from, or imported to India, and I would certainly distinguish clearly between produce destined for (1) Indian markets, (2) Export markets.

It might be well to have "Commodity Associations," formed when possible, which would enable prices to be controlled as well as purity.

I quote here from a note by a manager of one of India's largest Oil Mills:—

"One of the disadvantages of the vegetable oil industry in India as a whole is adulteration. The Indian market is not prepared to pay any high prices for pure crude oils, thus preventing any systematic and efficient crushing work, this also applies to the second oil mill product, *viz.*, oil seed cake for foodstuff.

The Government tends to encourage adulteration of all vegetable oils through its failure to control the importation of mineral oils which are

largely used throughout India to adulterate and cheapen many of the vegetable oils. Imports of white mineral oil and all similar products which are definitely known and used for adulteration should be heavily taxed. Indian oil mills cannot compete with foreign manufactures so long as the above conditions continue and so long as Indian raw material stays at its present high prices."

Whenever I have come into contact with business firms I have heard the criticism that foreign importers of Indian produce (I refer to such oil as is exported and cake) complain of adulteration, and that reliance cannot be placed on the goods being up to specification.

I will further quote from the note mentioned:—

"Of all the above points I consider adulteration to be the most important by far. Considerable aid would be given to the oil mill industry if rigid National Pure Food laws were enacted. However this alone should not prevent adulteration of oils in India. Government aid (of which there are many varieties other than direct or even indirect grants of money) should be given to help the oil mill industry to discourage adulteration. For instance, acknowledgement of the Government in its various Departments, such as the army, of the value of the dietetic value of pure vegetable oils would be of very considerable help to the oil mill industry in raising the standard of such food products in India. The Indian Army, and therefore the Government, is probably the only Government of importance in the world that refuses to recognise the high food value of pure vegetable oil products."

(*d*) I think that the Central Department of Agriculture should have an Information Bureau, from which should emanate all the information enumerated in this paragraph, this could be sent out in pamphlet form or otherwise in such a manner as to be brought to the knowledge of all to whom such information should be of use.

Take the oil industry, for example, to which I am confining my remarks. People may talk glibly about developing an industry which is not at present developed, but this will not be done with any degree of success unless the whole of the factors both local and overseas which may affect such development are borne in mind. Every aspect of Indian agriculture should be studied in relationship to world produce and world markets, and every specific industry should be undertaken and controlled only by people with the requisite knowledge, and as mentioned above steps should be taken to diffuse this knowledge in quarters where it is required.

QUESTION 21.—TARIFFS AND SEA FREIGHTS.—I will continue to quote from the Oil Mill Manager mentioned above:—

"Furthermore the customs policy of India is directly in opposition to the customs policy in other countries on oil bearing oil material. European countries are tending more and more to place preferential import duties on manufactured oils and allow raw materials to come in free. England does this by preferential freights on seed. India, on the other hand, places a tax on the importation of raw material which distinctly tends to prevent Indian Oil Milling Industry from competing in any export trade so long as oil bearing raw material in other countries are sold at lower prices than in India."

It would seem that a duty on manufactured articles, such as *ghi*, coming into India would assist the cultivator in so far that if it were produced in the country he would get it cheaper. Freightage would be saved and this is heavy; for example, freightage of cocoanut oil to London was 64½ shillings per ton and copra Rs.50, when this report was written, and similar high freights exist for other seeds and cakes.

I would suggest then that the existing duties in relationship to Indian industry do, in certain cases such as mentioned above, affect the Indian cultivator, and that the recommendations outlined would be beneficial.

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QUESTION 23.—GENERAL EDUCATION.—(*a*) This question opens up problems of encyclopædic difficulty and significance, and while wishing to state my views as briefly as possible, I find it extremely difficult to answer part (*b*), as the spread of education and industrial activities have created a state of affairs in other countries, notably England, which is characterised by a transfer of land workers from the country to the towns in order to seek occupations other than agriculture. If the logical result of education creates this disturbance of agricultural stability, as it appears to do, then we may look for an intensification of the symptoms which are already making themselves felt in India. Before the British regime there was no "Higher Education" in India to speak of and such instruction as the masses received was given in villages by the village instructors and confined more or less to the occupations which the people were likely to follow:—the simplest rendering of the three R's, and such information as would enable the pupil to follow his small transactions in village activities such as buying and selling, barter, etc.

(iii) The present elementary school education which takes a boy up to about the age of 10 is a more systematic rendering of the old system, as far as my limited experience permits me to judge, and does not carry the pupil to a range where he becomes divorced from the activities of his family on the land.

(ii) In the middle schools, the pupil remains till about the age of 14 or perhaps 16, if he proposes to matriculate, and it is at this stage that the present system of education produces a first tendency for the student to leave the land and aspire to something a step higher in the social scale. We see to-day Universities with matriculation rolls approaching 20,000 and these vast armies of students with their passed and failed qualifications consider themselves now rather beyond a life of hard and exacting toil on the land, as they have not been educated with a view to returning to the land, also the middle schools are steps in the ladder towards the Intermediate Colleges and the Universities, on attaining which the student is almost entirely removed from any possibility of reverting to the status of an agriculturist.

(i) With the exception of such as enter Agricultural Colleges, the student is now practically lost to agriculture, and it is extremely problematical whether the education given in the higher institutions in any way conduces to the agricultural efficiency of the people in so far that those who have received it apply their knowledge to the land.

This, after all, is only a recapitulation of the story as developed in England, with the difference that England is an industrial country and India is not, and it seems to me that we are up against a fundamental difficulty, viz., that if we admit the right of an individual to as high an education as he can get and provide the means to attain it, then the inevitable result is a withdrawal from the land, and in India there is no market to absorb the produce thus created and we have a vicious circle whereby the land which provides the one basic industry tends to become starved.

(*b*) In attempting to answer this, I find myself somewhat at a loss, because the condition of the vast majority of the agriculturists is not as satisfactory as it might be. As previously remarked, the question of holdings and indebtedness are important ones to consider and where, fragmented holdings are found and a man on a small holding has several sons, he will not want them all on his farm. Generally speaking, I consider that rural education must follow, and not precede, a general amelioration of the lot of the agriculturist. While he is confronted with the hardships and difficulties which he experiences at present, the natural result of education with the small holder will be to try and avoid them.

A NOTE ON THE RELATIONSHIP OF THE FEDERAL AND STATE DEPARTMENTS OF AGRICULTURE IN AMERICA IN COMPARISON WITH THE IMPERIAL AND PROVINCIAL ORGANISATIONS IN INDIA.

The granting of Provincial autonomy in India has necessitated some dislocation of the original relationship of the Imperial Department of Agriculture with its headquarters at Pusa, to the various Provincial departments, each of which now has it own Minister, organisation, staff and administration; and with the onward march of affairs in every department of activity, some readjustment is necessary perhaps, in what was hitherto a self-sufficing machinery. As agriculture is the life of India, and the best organisation for the full development of scientific research is necessary, the question of the relationship between the Central and Provincial departments is an important one if the best results are to be obtained from agricultural co-ordination and research for the separate Provinces and for India as a whole.

It can be said with a fair degree of candour, that there is no connection between the Central and Provincial departments from an administrative, and very little from a scientific point of view and the question may well be asked whether in the present state of advancement of the country the existing system is the best that can be desired.

In seeking for guidance in the solution of a problem such as this, one may well search round to discover whether there are any parallel cases in the world of vast countries which have, or have had a situation in any way resembling that found in India, a Central Government, and also Provincial Governments possessing a large degree of autonomy. It is not to be suggested for one moment that a country such as India with its own peculiar conditions, should set out slavishly to copy another, but it may well pause to study a great organisation such as is to be found in the United States and cogitate on the very obvious lessons which are to be learned thereby and ask whether we in this country cannot strike out upon wide lines of development more in accordance with the necessities of the people, and the spirit of the times.

A three months' visit this year to the United States and Canada, during which the writer travelled nearly 10,000 miles in the country and visited more than a dozen Universities and Agricultural Departments, enabled him to gain some insight into the agricultural organisations established there, and to form some comparison with our own in India, if one can be permitted to compare two countries so manifestly different. India cannot bear a comparison with America, because she is different, but India with her vast population three times as large as that of the United States is aspiring to, and advancing towards the status of a political entity, and consequently she is worthy of, and requires, that her agricultural organisation and research on which her whole wealth and destiny depend, shall be of the best and most far reaching, and be able to compare favourably with those in other countries of the world.

It may, therefore, be worth while to take a glimpse at the organisation and work of the United States department of agriculture, in the hope that some useful lessons may be learned which could be turned to good account in India.

America possesses a Federal Government and a Federal Department of Agriculture both situated at Washington, the capital of the Republic, corresponding to the Central or Imperial Government in India, and the Imperial Department of Agriculture, the latter, however, in India being situated in a spot both isolated and not readily accessible, a factor which at the outset must detract from its possibilities and its use.

There are 31 States in the Republic of America and each of these possesses its own State Government and Department of Agriculture, which latter is in a very live relationship and contact with the Federal Department at Washington.

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It might be advantageous to discuss this latter first, to examine its organisation, the part it plays in the national life and its connection with the Provincial departments.

We have here an organisation which is without parallel in the world. In itself it is complete in every department bearing on the agricultural welfare of the country as a whole; it is without stint either in its staff, or its expenditure. The attached chart shows in a condensed form the general organisation of the department at the head of which is the Secretary who is directly answerable to Congress. He is charged with the work of promoting agriculture in its broadest sense. He exercises general supervision and control over the affairs of the department, and formulates and establishes the general policies to be pursued by its various departments. He works by co-operation with Congress, the respective States and the several branches of the Federal department. This department was created in 1862 and raised to the rank of an executive department in 1889. For the sake of interest I propose to give a few budget allotments for the executive departments of the various Bureaux (which will be mentioned later) for the year 1915-16. The amount allocated to the Secretary's office was 3,01,860$. The Secretary has an Assistant Secretary with budget of 18,050$.

Solicitor's Office.

This official deals with the direction of the legal work of the department and acts as legal adviser to the Secretary and the heads of the several branches of the department and represents it in all legal matters and approves, in advance of issue, all orders and regulations promulgated by the Secretary under statutory authority, and he co-operates with all branches of the department, U.S. Attorneys, etc.

His budget allotment is 171,280$, which includes 70,000$ for the acquisition of lands.

Disbursing Office.

This keeps appropriate ledgers relative to the advance and disbursement of all items of appropriations and a pays accounts properly certified.

Budget allotment 42,020$.

The library branch has an expenditure of 50,000$.

The Office of Information, secures the widest possible circulation for discoveries and recommendations of Scientists, Specialists and field workers of the department, agricultural advice, warnings and all other relevant information, and supplies the public press with facts taken from publications, and also from oral statements of specialists in a form to attract attention and lead to the adoption of the methods recommended. A specialised information service exclusively for agricultural papers has been inaugurated. This office also issues a weekly news letter containing seasonal and other information in a popular form, and has editorial supervision over the departmental circular.

The expenditure allotted was 18,060$.

The Office of Inspection.

Acts as the clearing house of the Secretaries office in fiscal transactions between the various Bureaus claimants, etc. It handles all fiscal correspondence between the Secretary's office and the Treasury department and personal inspection matters. Expenditure 21,140$.

The Office of Exhibits.

Handles the correspondence of the department relative to exhibits at fairs and expositions of various kinds, co-operates with the several departments of the department in preparing exposition material, and in short takes

entire charge of installing and displaying exhibits. For example, during the year 1915-16, it supervised and demonstrated the exhibit of the department at the Panama-Pacific International Exposition, San Francisco, California. It co-operates with all branches of the departments and with the State Colleges and experiment Stations throughout the United States. Expenditure in 1915, 24,630$.

The Office of Forest Appeals.

Has under the immediate supervision of the Secretary an officer independent of the Forest Service, by whom appeals from the decision of that Bureau affecting land claims and land classification matters might be passed upon. Expenditure 5,200$.

In addition to these, there are minor sections, such as Chief Clerks Office, Supply Section, Mail and Files Section, involving an expenditure of 440,000$.

The above enumeration will give some indication of the main administrative offices. Branching out from these are three offices, viz. (1) The Director of Scientific Work, who supervises and regulates all the scientific work of the department and the experiment stations.

(2) The Director of Regulatory Work, who supervises all the regulatory work of the department, and

(3) The Director of Extension Work, who supervises all the extension work of the department, including co-operative extension work, exhibits and motion pictures.

We now arrive at the individual units or Bureaus over which the above offices exercise control, roughly 17 in number, as shown in the plan aforementioned.

A glance at the sub-headings under any one of these will give some indication of the comprehensive nature of the functions performed and their ramifications into all branches of the national life in a manner which could not possibly be performed by the State colleges and departments of agriculture themselves.

It would be as well to take one of these Bureaus, say, Animal Industry, and consider it somewhat in detail in order to gain some insight into the functions which it performs.

Bureau of Animal Industry.

Administration.

This supervises the Bureau's activities and the performance of such duties as are common to the Bureau as a whole, the cost of which cannot be readily apportioned against the various projects involved. Proposed expenditure in 1915-16: 143,000$.

Sub-branches.

I.—The control of Meat and Meat food products.

Supervises all the work of meat inspection, including the direction of some 2,500 employees at all the slaughtering centres of the United States.

Expenditure 61,000$.

Research Branches.

These include bacteriological investigations of meat and meat food products. Investigations of fresh meats in cold storage.

Investigation of Canned meats.

Investigation of pathological conditions noted during the meat inspection.

Investigations on the control of the house fly and other insects in establishments operating under the Federal meat inspection.

Supervision of the preparation and distribution of meat.

Examination of imported meats and meat food products and about fifteen more similar headings under this branch alone.

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It may be noted that the central Government does not leave the question as to whether its citizens get pure or impure food to the State Governments. It itself sees that they do, and it incurs an expenditure of three and a half million dollars in doing it, and has in addition about two hundred and thirty meat inspection stations costing an additional 3½ million dollars.

II.—Dairy Investigations.

Administration and extension work such as:—Demonstrating the practicability of the small community raising its economic status through the employment of a field instructor skilled in dairying.

Demonstrating the practicability of reclaiming a worn out cotton farm by dairying.

To determine the best form of co-operation for the development and inrease in the entire production of the dairy herds of the United States.

Breeding Holstein cattle suitable for the semi arid west, and so forth. The total expenditure on this section was 63,850$.

III.—Dairy Manufacturing.

The object of this is the general supervision of all work in dairy manufacturing including extension work done with Creameries by correspondence. Research, extension and regulation work is carried out. Total expenditure 46,870$

IV.—Dairy Research Laboratories.

These laboratories are scattered all over the country and carry out every variety of dairy research on milk, cream, cheese, etc.

Total expenditure 52,785$.

V.—Milk Investigations and Demonstrations.

The object is to study the sanitation of city milk supplies, investigate factors influencing the commercial quality of milk, and devise means for producing and handling milk of a superior quality.

Total expenditure 23,550$.

VI.—Dairy Division Experimental Farm.

All conditions affecting the breeding, feeding, housing and care of dairy cattle are investigated, including, feed production, silage investigations, metabolism in dairy cows, and the construction of buildings.

Total expenditure 37,280$.

This Farm is situated at Washington.

VII.—There is also a "Western Dairy Extension" with similar objects with an expenditure of 31,790$.

Animal Husbandry Investigations.

VIII.—Animal Breeding Investigations.

To study the principles of animal breeding by the use of small animals.

IX.—Live Stock Investigations and Demonstrations.

This includes work on the economic production of pork, beef, and mutton, on live stock transportation, live stock production on irrigation products and general beef cattle and animal husbandry extension work in various districts.

Total expenditure 53,040$.

X.—Horse and Mule Investigations.

For all purposes civil and military.

Total expenditure 59,520$.

XI.—Poultry Investigations.

Including poultry feeding, breeding improvement of the market egg. Incubation of eggs. Turkey investigations. Total expenditure 35,140$.

XII.—Sheep and Goat Investigations.

For producing a type of sheep for range conditions which will shear a profitable amount of wool of long staple, and have good mutton conformation.

To study various breeds as combination wool-and-mutton sheep for various districts.

To develop profitable milk producing goats, to study the feeding of milk goats, and the value of goats milk.

The classification of wools.

Total expenditure 124,440$.

XIII.—The Animal Husbandry Experiment Farm at Washington.

This furnishes facilities for investigations in the breeding and feeding of all farm animals, and their certification.

Expenditure 30,000$.

XIV.—The Investigation of Animal Diseases.

This is a comprehensive branch for animal pathological work throughout the United States.

Expenditure 108,500$.

XV.—Poisonous Plant Investigations.

The object is to study and report on losses of stock from poisonous plants and to develop methods of avoiding losses.

Expenditure 10,000$.

XVI.—Hog Cholera Work.

Involving research and treatment of hog cholera. Total expenditure 218,000$.

XVII.—Eradication and Control of Animal Diseases.

The undertaking of all work connected with the eradication and control of animal diseases, and prevent the spread of these diseases from state to state.

Expenditure 606,675$.

XVIII.—The Eradication of cattle Ticks or Live Stock Demonstration.

Involving the extermination of ticks which spread the infection of splenetic fever in cattle, and to demonstrate to farmers the best means to better develop the live stock industry and dairying in the areas freed from cattle ticks. Also work on the inspection and quarantine of imported animals.

Expenditure 98,855$.

XIX.—Export live stock investigations.

Expenditure 6,400$.

XX.—Control of the manufacture, importation and shipment of viruses serums, etc.

Total expenditure 105,000$.

XXI.—Insecticide and Fungicide Investigations.

Expenditure 4,850$.

These are the major headings under the Bureau of Animal Industry, and the cost of this one department (one out of about 20) approximate, 9 million dollars or about 25 million rupees.

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The Bureau of Chemistry.

Space does not permit me to indicate more than the fact that the Bureau is a complete entity in itself with its own administration and research Laboratories situated at Washington and throughout the country in which every conceivable problem in any way connected with agriculture in all its branches receives exhaustive consideration, more particular attention being given to the wider aspects of chemical investigation which concern the country as a whole.

Let me take one small sub-head as an illustration of the work being undertaken in 1915, which may illustrate what I mean by a wide chemical investigation.

Sub-Head.

To study the influence of environment on crops and plants.

Object.

To determine what role is played by the composition of the seed and the effect of environment on the composition of the crop.

To determine what influence on the composition of plants may be attributed to climatic agencies and to soil.

To determine the influence which soils have on the composition of wheat in contra distinction to that affected by other environment agencies.

To obtain thorough knowledge of the quality of grains grown in the different states. To see what chemical and physical changes take place in cereals during storage.

To note what effect, if any, the stacking and shocking of wheat have on the quality of the flour.

To obtain data showing the value of leaves for manurial purposes.

To determine the amount of plant food and other constituents which may be removed from plants by the action of rain.

This is one of about 100 similar headings, the total cost of which approximates 2,000,000 dollars.

In an endeavour then to illustrate the nature, structure and work of this great organisation, these illustrations will suffice, but the query may well be made "what then is precisely the relationship between this Central or Federal Department and the various State Departments," and this is a question which Americans themselves find somewhat difficult to answer, so intricate and interwoven has the process of development become. From the illustration which I have given it will be seen that the Federal Department can be considered to concern itself more directly with those broader aspects of Research control which may be said to affect the economic welfare of the country as a whole, whereas the various State Departments are engaged in dealing with broad lines of scientific enquiry in the various sciences corresponding to the various Bureaus of the Federal system, but are also working out corresponding investigations relating more particularly to the individual States.

The State Departments are in one sense independent of the Federal Department, in that they have their own administrative organisation and institutions, and in another sense they are not independent. For example in many of the States which I visited I found experiments in progress which were being carried out in conjunction with Washington, that is to say as an integral part of the larger experiment which the Federal Department was conducting as an "All America Investigation," and for which the Federal Department gives a grant. As an example one may mention, pig-breeding trials which were in progress at the state college Pennsylvania, in collaboration with Washington; here the mineral requirements of pigs were being investigated, and also a competition instigated for "The economic production of one ton of pork."

There is considerable competition, not only among the States for this Federal favour, but also between various sections of the various departments. The system is elaborate and intricate, but efficient and stimulating.

We might perhaps metaphorically illustrate the relationship between the Federal and State Department by a rough analogy between the various organs of the composite animal body, and the blood or the nervous system which supplies helps and co-ordinates them, each organ is self-contained and independent, yet it is not, it receives sustenance and support from headquarters so to speak, a rough analogy, it is true, but it may help to illustrate the arrangement. Such is a brief general survey of the great central co-ordinating Federal Department, which is a very living factor in the national life, and which percolates down and touches every member of the community.

In any town of the United States it is possible to go into a "caffeteria" or restaurant and buy a sealed bottle of milk off ice, which can be opened and drunk on the spot, and which is known to be pure and wholesome, as its production and manipulation is under the direct supervision of the Federal Department. Every State citizen is a citizen of the Republic, and as such the Republic guards and controls the quality and condition of his food. There is more milk drunk per capita in the United States than in any other country of the world, and every individual can get pure milk in abundance at a moderate cost.

If the Imperial Department of Agriculture in India could in this one line alone ensure that a pure milk supply was available at reasonable cost to its 350 million people, we may well ask ourselves what would be the result in national efficiency and progress. There is no necessity to seek for problems of paramount national importance, they are confronting us by the multitude. Research in animal and human dietaries in relationship to disease, climate and race is one which the Central Government might well set itself out to pursue to the untold advantage of the people, and perhaps a justification for comparing the activities of the Federal Department in the United States with the Imperial Department in India may be found in the stimulation which this country may receive in tackling many of the broader national problems which await solution in scientific agriculture in its widest sense, by seeing what has been achieved in one of the most progressive, if not the most, progressive country in the world, utterly dissimilar though the two countries and their conditions may be.

Even giving the most sympathetic consideration to the relative wealth and resources of the two countries, we may still venture to compare the relative expenditure on agricultural research and the staff to carry it out, in India with that in America.

India's wealth lies in her agriculture, and it cannot be too earnestly impressed on those responsible for the country's welfare, and all that that welfare implies, that intensive co-odinated research is of paramount importance; more workers of the highest qualifications and ability are urgently wanted, and none but these, if all India problems are to be adequately tackled, and it is of the greatest importance that the Central Department of Agriculture in India should be so organised and extended as to bring its activities to bear with greater force on the national life. The ways in which this can be done are manifold, and what is wanted is a greater appreciation of the value of research, and more money to enable this research to be carried on.

Having roughly surveyed the organisation of the United States Federal Department, and its relationship to the States, a few words may be given on the State Departments themselves.

Each State is independent in its own internal affairs, in much the same way that the various provinces in India are, and each possesses its own Agricultural Department, Colleges, and Experiment stations, but there

perhaps the analogy ends, as in organisation, range of activities, and of course expenditure, we in all fairness cannot make a comparison with corresponding Institutions in India.

In order to give some idea of the organisation and extent of these various State Departments, we may confine ourselves to one only, although they differ somewhat in their constitution, and relationship to the State legislatures and the State Universities. The experimental stations are also in some cases under the supervision of the United States Department of Agriculture as in Porto Rico.

As an illustration of a State department, the Pennsyvania State College may be taken as this is the Pennsylvania unit in a national system of State Colleges created under an act of the United States Congress in 1862, and an Act of the General Assembly of Pennsylvania in 1863, and it was specified that its leading object should be, without excluding other Scientific and Chemical studies, to teach chiefly such branches of learning as are related to agriculture and the mechanic arts. The college is supported by grants from the Federal Government and the State Legislature.

Its total income for the year 1923 for a two year period amounted to about 2½ million dollars derived from these sources.

This School of Agriculture and Agricultural Experiment Stations possesses a complete faculty, a station staff and an extension staff, and it is usual to find that a member of the Faculty is also a member of the station, or of the extension staff, *i.e.*, a research worker also lectures on his particular work, but not always, and similarly with the extension work. The adequacy of the staff renders this an easy matter and as the subjoined table will indicate, there is no overlapping and each man confines himself to his particular branch of work. In no case would a man in the animal husbandry department say, be engaged on soil work.

Corresponding to the Faculty, the Station and the Extension Work, there are as heads, the President of the College, The Dean of the Agricultural school or Director of the Station, and the Director of Agricultural Extension Work.

The following are the various branches showing the numbers of Professors and Assistant Professors engaged in the various sub-divisions of each branch. These do not include subordinate routine staff, and are quite independent of any staff of the Federal Department.

Agronomy and Soil Science	13
Animal Husbandry	21
Botany	15
Chemistry (Agricultural or Biological)	9
Dairy Husbandry and Bacteriology	17
Economics (Agriculture)	7
Rural Education	5
Entomology and Zoology	11
Extension (Administrative)	10
Farm Machinery	4
Farms and Forestry	8
Home Economics	17
Horticulture	17
Miscellaneous	2
Animal Nutrition (Special)	8
Total	164

Similar lists could be given for all the other State or Provincial departments of agriculture, and it is interesting to compare this list with a

corresponding one for any particular province of India. Admitted that comparison between the two countries is not to be expected, we can at least see how utterly impossible and futile it is to expect that any one individual specialist can hope to adequately tackle the problems which present themselves in any one branch, to say nothing of covering several. It would be well if those in authority could realise the bewildering complexity of adequate or systematic research, and that, if a research worker (I refer to the higher technical staff) is to do himself justice, he must concentrate his energies on one or two problems and not disperse them over many, otherwise he will merely be wasting his time and giving a false impression of efficiency.

A word here on the extension service might not perhaps be out of place as it is a most important channel through which general agricultural information and results of experimental work are distributed and made effective throughout the State, and the same applies to the Federal Department

The agricultural extension activities deal with production, agricultural economics, and all the factors which centre around the life of tne home. The work is carried on through definite and systematic community programmes in each country in co-operation with a county organisation developed for that specific purpose and known as the Country Agriculture Extension Association.

A resident representative of the Agricultural College is located in each county in which definite work is under way. Extension specialists are in charge of various lines of subject matter such as dairying, poultry, etc., and these specialists lead the work along their several lines throughout the State and assist the county representatives in developing and carrying out the projects in the communities.

The work in home economics is carried out in much the same manner as that in agriculture, by trained home economic workers from the colleges.

In this extension work alone at the Pennsylvania Agricultural Department at the present time 1925, there are forty-three agricultural specialists, twenty-five home economic specialists and seventy-five country representatives.

It is unnecessary to give corresponding details for other States, some are more advanced than others, all tell the same story, which brings one back to the introductory remarks of this paper. Can we, knowing the present limitations of India gain any help or suggestions from a great machinery working in such a progressive country as America? I think we can, we have our own problems and our own peculiar difficulties, and one might venture to suggest that at the outset the policy be adopted of making the Imperial Department of Agriculture a more living and dynamic force in solving the agricultural problems common to India as a whole. It took a dynamic mind to start it going, it must now be kept going and extended and this requires dynamic minds also. One might suggest that such modifications as may be found necessary in some of the broad outlines and methods indicated in this note be seriously considered, and that the Central Government, being fully aware of the absolute necessity of India endeavouring to keep pace with other countries in the development of her scientific agricultural work, be advised to appoint a small committee of men well qualified for the task of overhauling the present machinery and submitting concrete proposals for developing the Imperial department of Agriculture to a position more in consonance with India's progress and aspirations.

N.B.—The above note was written before the writer was aware that a Royal Commission was being appointed, the hope expressed in the concluding sentence has therefore materialised.

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ORGANIZATION OF UNITED STATES DEPARTMENT OF AGRICULTURE.

SECRETARY.
ASSISTANT SECRETARY.

EXECUTIVE OFFICES. | SOLICITOR. | DIVISION OF ACCOUNTS | PUBLICATIONS. | PRESS SERVICE. | LIBRARY.

DIRECTOR OF SCIENTIFIC WORK.
SUPERVISES ALL SCIENTIFIC RESEARCH WORK OF THE DEPARTMENT.
Office of Experiment Stations.

DIRECTOR OF REGULATORY WORK.
SUPERVISES ALL REGULATORY WORK OF THE DEPARTMENT.

DIRECTOR OF EXTENSION WORK.
SUPERVISES ALL EXTENSION WORK OF THE DEPARTMENT.
Office of co-operative extension work.
Office of exhibits.
Office of motion pictures.

Weather Bureau.

Weather forecasts and Warnings.
Hurricane and Storm Warnings.
Cold Wave and Frost Warnings.
River and Flood Service.
Agricultural Meteorology.
Climatology.
Aerological investigations.
Marine Meteorology.
Solar radiation.
Instrument calibration, construction and repair.

Bureau of Animal Industry.

Animal husbandry Division
Biochemic Division.
Experiment Station.
Field Inspection.
Hog Cholera Control.
Meat inspection.
Pathological Division.
Tick Eradication.
Tuberculosis Eradication.
Virus serum control.
Zoological Division.

Bureau of Dairying.

Bacteriology and Chemistry of milk.
Dairy Cattle breeding.
Nutrition of dairy cows.
Dairy herd management.
Dairy Sanitation.
Dairy plant management.
Market milk.
Dairy products and by-products.
Dairy introduction.
Dairy Engineering.
Renovated butter inspection.

Forest Service.

Administration of National Forests.
General Administration and Protection.
Timber management.
Grazing.
Land Acquisition, Adjustment and occupancy.
Engineering - Maps and Surveys Roads.
Water power.
Promotion of forestry.
Practice:
Cooperation with States.
Co-operation with private owners.
Research:
Dendrology Forest economics.
Forest management.
Forest products.

Bureau of Plant Industry.

Pathological Laboratory.
Plant disease survey, and Pathological collections.
Fruit diseases.
Citrous Canker Eradication.
Forest Pathology.
Blister Rust control.
Cotton, Truck and Forage crop Diseases.
Crop physiology and breeding.
Soil bacteriology and plant nutrition.
Soil fertility investigations.
Crop accumatization and adaptation.
Fiber plants.
Drug poisonous and oil plants.
Physiological and fermentation investigations.
Agricultural technology.
Seed testing.
Cereal investigations.
Tobacco investigations.
Alkali and drought resistant plants.
Sugar plants.
Economic and systematic botany.
Dry land agriculture.
Western irrigation agriculture.
Horticultural investigations.
Foreign Seed and plant introduction.
Forage crops.
Biophysical investigations.
Plant Geography, Demonstrations on reclamation projects.

Bureau of Chemistry.

Analytical reagents.
Animal Physiological Chemistry.
Carbohydrates.
Cattle food.
Colour investigations.
Crop Chemistry.
Drug control.
Field, food and drug inspection.
Food control.
Fruit and vegetable utilization.
Insecticides and fungicides.
Leather and paper.
Microbiology.
Microchemical.
Nitrogen laboratory.
Oil, fat and wax.
Pharmacology.
Phytochemical.
Plant dust explosions.
Protein investigations.
Special collaborative investigations for other Government Departments.
Tea inspection.
Water and beverages.

Bureau of Soils.

Soil survey.
Classification of lands
Soil chemistry.
Soil physics.
Fertilizer.
Resources.
Nitrogen section.
Phosphate section.
Potash section.
Concentrated Fertilisers.
Soil amendments.

Bureau of Entomology.

Southern field crop insects.
Cereal and forage insects.
Deciduous fruit insects.
Tropical and sub-tropical insects.
Truck crop insects.
Stored product insects.
Forest insects.
Insects that affect the health of man and animals.
Bee culture.
Preventing the spread of gipsy and brown tail moths.

Bureau of Biological Survey.

Biological investigations.
Wild animal life.
Bird migration.
Economic investigations.
Injurious animals.
Fur production.
Food habits
Research.
Migratory bird.
Treaty and lacey acts.
Reindeer and fur bearers in Alaska.
Game and bird reservations.

Bureau of Public Roads.

Highways:
Administration—
Federal aid road funds.
Distribution—
War surplus for road building.
Engineering—
Plans, surveys.
Supervision.
Maps.
Tests of material.
Research—
Physical design, materials, effect of traffic.
Chemical—materials.
Economic—Highway utilization and transportation—commodity and traffic surveys.
Co-operative projects.
Forest highways:
Administration—
Forest Highway funds with forest service.
Engineering—
Building and maintenance.
Agricultural Engineering.
Research Drainage—farm, district flow of water.
Irrigation—
Duty of water works, pumping.
Farm engineering—
Farm power.
Equipment.
Buildings.

Bureau of Agr. Economics.

Farm management
Cost of production.
Crop and livestock estimates.
Cotton marketing.
Grain marketing.
Fruit and vegetable marketing.
Livestock, meats and wool marketing.
Dairy and poultry products marketing.
Hay, feed and seed marketing.
Cost of marketing.
Warehousing.
City markets.
Agricultural finance.
Land Economics.
Agricultural co-operation.
Statistical and Historical research.
Foreign competition and demand.
Farm population and rural life.
Market news and economic information.

Bureau of Home Economics.

Food and Nutrition Economics.
Clothing and Textiles.
Home relationships.
Housing and equipment.
Arts in relation to home life.

Federal Horticultural Board.

Foreign Plant Quarantines
Domestic Plant Quarantines.
Port Inspection Service.
Mexican Border Inspection Service.
Central (D. C.) Inspection Service.
Pink Bollworm Eradication.
Potato Wart Eradication.
Date - palm Scale Eradication.
Plant Quarantine surveys.

Insecticide and Fungicide Board.

Enforcement of the Insecticide Act of 1910 designed to prevent the manufacture, sale and transportation of adulterated or misbranded insecticides and fungicides (including disinfectants) which enter interstate traffic, are offered for importation from or exportation to foreign countries, or are manufactured or sold in the territories or the district of Columbia.

Packer and Stockyard Administration.

Trade practices rates, charges and registration.
Auditing and accounting.
Investigating and research.
Legal questions.

Grain Futures Administration.

Supervision of trading in futures.
Investigations and research.

Fixed Nitrogen Research Lab.

Administrative Division.
Chemistry Division.
Engineering Division.
Physics Division.
Synthetic Ammonia Division.

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A NOTE INDICATING THE RELATIONSHIP BETWEEN THE UNITED STATES FEDERAL DEPARTMENT OF AGRICULTURE, AND THE STATES' DEPARTMENTS, SHEWING THE SECTIONAL ACTIVITIES AND A YEAR'S EXPENDITURE ON THE SAME, BY DR. P. E. LANDER, M.A., D.Sc., A.I.C., AGRICULTURAL CHEMIST TO GOVERNMENT, PUNJAB.

The Federal Department.

The agricultural organisation of the whole of the United States of America is centred in the Federal Department at Washington, at the head of which is the Secretary for Agriculture, whose duties are to promote agriculture in its broadest sense. He exercises general supervision and control over the affairs of the department and formulates and establishes the general policies to be pursued by its various branches and is directly answerable to Congress for the working thereof. The administrative officers and laboratories are situated at Washington and for the sake of descriptive convenience may be divided into Bureaus as shown on the accompanying chart. Each Bureau is a separate organisation in itself under its Director, the scientific work of the whole of the Bureaus being controlled by the Director of Scientific Work.

We may describe the functions of these bureaus taken as a whole to be concerned with every conceivable aspect of agriculture which concerns the national welfare and they are of nation wide extent, possessing experimental stations both independent of, and co-operating with, the State experimental Stations. They are concerned with the wider aspects of Agriculture which the States could not be expected to investigate, such as the national aspects of marketing, the co-ordination of transport, and the road construction policy and actual construction to deal with produce.

The activities of these Bureaus cover the fields of research. The economics of agriculture, and agricultural education, and as the various experimental stations are broadcast throughout the country, a close co-operation is maintained with the State stations for each particular problem in hand.

In the field of research the lines of investigation under any one Bureau are too numerous to mention here, but in the majority of cases, special grants are made, and special workers deputed to carry on the work, and almost invariably, "In co-operation with one or more of the States Experimental Stations."

Before proceeding to an enumeration of the various Bureaus and their expenditures, it would be as well to examine one of them in particular, viz., "The States Relation Service" as this is a Service or Bureau which functions in particular as the connecting link between the Federal and the States Departments, and should enable us to gain some knowledge of how this relationship is worked and maintained.

The States Relation Service.

This service is under a Director who exercises the general administration of the service, the object of which is to correlate the activities of the Federal and State activites, and to enforce the provisions or an Act approved in March 1887, and acts supplementary thereto, and also of an Act of March 1906, creating and endowing agricultural and experimental stations:—to enable the Secretary of Agriculture to certify to the Treasury Department whether Federal funds may properly be advanced to the State Experimental Stations, and to report to Congress regarding the work and expenditures of these stations. In addition, it furnishes information regarding the organisation, equipment, resources and work of experimental stations and kindred stations throughout the world, to workers in similar lines in the U.S. Department and the various agricultural colleges, schools

and experimental stations, and more generally to aid the State Experimental Stations in the effective development of their work.

Such in brief is the object of this correlating agency and a word as to its method of proceduce may be given.

Method of correlating Federal and States Work.

A financial report on schedules approved by the Secretary of Agriculture is received from each station, and is examined and approved, together with written and printed reports of the work and expenditures of each station, and a personal inspection of the work, accounts books and vouchers of each station is made annually.

This latter may be considered to present an unsatisfactory feature, but a reference to the millions of dollars which the State allots to the experimental stations would silence criticism on this point regarded solely in the light of administrative procedure.

On the basis of the information gained from the aforesaid sources, a report of the work and expenditures of each station is made annually to Congress, and distributed both in America and other countries. The plans for the work of each stations are reported to the Director of the States Relation Service and approved by him in advance of their execution. This service also abstracts the publications of agricultural institutions throughout the world, and publishes the results in a journal entitled " Experimental Station Record."

Advice and information regarding the stations is also given, in large measure by correspondence and personal conference with station officers. It will thus be seen that there is a general supervision over the work of the experimental stations carrying on broad problems of investigation which are of concern to the nation as a whole, and when the latter is considered as an economic entity, the advantages of the system considerably outweigh the defects.

This service also conducts Farmers co-operative demonstrations throughout the States, and works in conjunction with the individual States Extension Services.

The complexity and completeness of the organisation prohibits any detail of description here, but in each of the 32 States of America there is also the individual

State Department and Experimental Stations

primarily established and financed either by the State or a University to which it may be attached, carrying out both education and research within its own provincial sphere, and, as outlined above receiving help from, and working with, the Federal Department in wider problems of national concern. (See also my previous note.)

Having thus briefly surveyed the relationship between the Federal and the States Departments, it is proposed to enumerate the various bureaus which are responsible for carrying out these activities, and to give for the financial year, 1916, the amounts spent by the U.S. Treasury on each, remembering that these amounts are entirely independent of the expenditures of the separate States.

	Dollars.
1. Office of the Secretary and General Administration	812,769
2. Bureau of Farm Management—	
(a) Total, Administration	36,612
(b) Total, Farm Economics	110,145
(c) Total, Farm Organisation	121,323
Grand Total	266,080

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	Dollars.
3. Weather Bureau. (Including the Washington Station)	347,540
Work of Stations	1,318,510
Grand Total	1,666,050
4. Bureau of Animal Industry. (Including control of meat and meat food products)—	
(a) Administration	173,000
(b) Control of meat and meat food products (Research, 23,500 and regulation 3,418,461)	3,441,961
(c) Meat Inspection Stations	3,214,674
(d) Dairy Farming (Extension, 53,350, Research 13,500)	63,850
(e) Dairy Manufacturing (Research, 12,850, Regulation, 9,600, Extension, 24,420)	46,870
(f) Dairy Research Laboratories	52,785
(g) Milk investigations (Research, 13,550, Extension, 10,000)	23,550
(h) Dairy Division Experimental Farm	37,280
(i) Live stock investigations and demonstrations (Research, 21,860, Extension, 31,180) ...	53,040
(j) Horse and mule investigations (Research, 29,250, Extension, 30,290)	59,520
(k) Poultry investigations (Research, 17,255, Extension, 17,885)	35,140
(l) Sheep and Goat investigations	12,440
(m) Animal Husbandry investigations (Research, 118,845, Extension, 86,835, Regulation, 3,660)	209,340
(n) Investigation of animal diseases	108,450
(o) Hog Cholera work (Research, 192,750, Extension, 25,250)	218,000
(p) Eradication and Control of animal diseases (Research, 6,575, Regulation, 590,000, Extension, 10,100)	606,675
(q) Inspection and Quarantine of imported animals (Regulation, 97,800, Research, 1,055)	98,855
(r) Export live stock inspection	6,400
(s) Insecticide and Fungicide investigations ...	4,850
Grand Total, Animal Husbandry	8,466,680
5. Bureau of Plant Industry—	
(a) General Administration (Research, 97,980, Extension, 12,800, Regulation, 200)	110,980
(b) Laboratory of Plant Pathology	31,610
(c) Pathological collections	11,050
(d) General orchard diseases	11,775
(e) Grape and small fruit diseases	11,500
(f) Fruit Rots and Physiological Fruit diseases	14,300
(g) Diseases of ornamental trees and shrubs ...	4,800
(h) Pathological problems in wood preservation	4,325
(i) Forest Tree Diseases	27,400
(j) Cotton diseases	4,148
(k) Truck crop diseases	43,670
(l) Crop Physiology and breeding investigations	54,780
(m) Distribution and Study of Legume Bacteria	18,620
(n) Soil Bacteriology investigations	37,050

	Dollars.
(o) Plant Nutrition investigations	10,950
(p) Soil Fertility investigations	33,540
(q) Acclimatisation, Adaptation and Breeding of Cotton	25,666
(r) Crop Acclimatisation investigations	41,860
(s) Drugs and their products	22,054
(t) Poisonous Plant investigations	2,500
(u) Investigations in Plant Physiology and Fermentation	24,526
(v) Agricultural Technology investigations ...	21,420
(w) Fibre Plant investigations	8,830
(x) Grain Standardisation investigations	88,820
(y) Biophysical investigations	29,580
(z) Seed Testing Laboratories (Research, 35,483, Regulation, 3,377)	37,860
(aa) Production and Improvement of Cereals and Cereal Products	28,055
(bb) Maintenance of General Cereal field stations	53,381
(cc) Cereal disease investigations	15,700
(dd) Corn investigations	43,220
(ee) Tobacco investigations	29,140
(ff) Alkali and Drought Resisting Plant investigations	25,000
(gg) Sugar Beet investigations	32,695
(hh) Botany of Economic Grasses	7,435
(ii) Investigations in Economic and Systematic Botany	34,380
(jj) Dry Land Agriculture investigations	167,120
(kk) Crop production under irrigation	62,245
(ll) Cotton Irrigation investigations	83,380
(mm) Pomological investigations	131,307
(nn) Horticultural investigations	68,233
(oo) Experimental Gardens and Grounds	53,630
(pp) Foreign Seed and Plant introduction ...	110,260
(qq) Forage Crop investigations	84,330
(rr) Seed Distribution	337,330
(ss) Demonstration on Reclamation projects ...	40,000
Grand Total, Bureau of Plant Industry ...	2,131,155
6. Forest Service—	
(a) General Administration	23,800
(b) Protection and Administration of National Forests	5,846,765
(c) Forest investigations	317,265
Grand Total, Forest Service	6,187,810
7. Bureau of Chemistry—	
(a) General Administration	109,500
(b) Agricultural Chemistry investigations ...	53,540
(c) Collaboration with other departments ...	15,200
(d) Poultry and egg investigations	43,120
(e) Fish investigations	20,720
(f) Biological investigations of food and drug products	10,000
(g) Citrus by-products investigations	10,721

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	Dollars.
(h) Enforcement of Food and Drugs Act (Research, 177,831, Regulation, 608,112) Total ...	785,943
(i) Investigation of Naval Stores	5,000
Grand Total, Bureau of Chemistry ...	1,053,743
8. Bureau of Soils—	
(a) General Administration	39,060
(b) Soil Chemical Investigations	22,770
(c) Soil Physical Investigations	15,685
(d) Investigation of Fertilizer Resources	36,920
(e) Soil Survey Investigations	193,500
(f) Classification of lands in Forest Reserves ...	20,000
Grand Total, Bureau of Soils	327,935
9. Bureau of Entomology—	
(a) General Administration	38,850
(b) Deciduous-Fruit insect investigations ...	60,800
(c) Cereal and Forage insect investigations ...	117,500
(d) Southern field crop investigations	62,000
(e) Forest and Shade tree insect investigations ...	58,830
(f) Truck Crop and Stored product investigations	44,620
(g) Tropical and Sub-Tropical fruit insect investigations	21,500
(h) Bee-culture investigations	16,360
(i) Miscellaneous insect investigations	54,520
(j) Investigation of the Mediterraneum fruit fly (Research, 15,200, Regulatory, 18,000) ...	33,200
(k) Moth investigations (Research, 265,000, Regulation, 55,744)	321,720
Grand Total, Bureau of Entomology ...	829,900
10. Bureau of Biological Survey—	
(a) General administration	35,390
(b) Game preservation (Research, 3,800, Regulation, 60,750)	65,900
(c) Economic investigations (Research, 130,850, Regulation, 150,350)	281,200
(d) Biological investigations	30,800
(e) Enforcement of Migratory Bird Law	51,000
Grand Total, Bureau of Biological Survey ...	464,290
11. Division of Publications—	
Publication work of the Department of Agriculture (exclusive of 500,000 Dollars general printing fund)	193,500
12. Bureau of Crop Estimates—	
(a) General administration	24,755
(b) Crop estimating and reporting	217,402
(c) Crop recording and abstracting	41,323
Grand Total, Bureau of Crop Estimates ...	283,480

	Dollars.
13. States relation service. (See context)—	
(*a*) General administration	54,470
(*b*) Relations with experimental stations (Research, 123,000, Regulation, 47,950)	170,950
(*c*) Farmers Co-operative demonstrations, Southern States	697,140
(*d*) Farmers Co-operative demonstrations, Northern and Western States	403,700
(*e*) Farmers Institutes and Agricultural Schools	25,600
(*f*) Home economics investigations	29,980
Grand Total, States Relation Service ...	1,381,840
14. Office of Public Roads and Rural Engineering—	
(*a*) General administration	15,389
(*b*) Road management investigations	56,139
(*c*) Road building and maintenance investigations (Research, 5,913, Extension, 152,545)	158,458
(*d*) Road material investigations (Research) ...	51,604
(*e*) Field experiments	65,009
(*f*) Irrigation investigations (Research, 102,905, Extension, 16,140)	119,045
(*g*) Drainage investigations (Research, 81,911, Extension, 29,500)	111,411
(*h*) Investigations in Rural Engineering	14,502
Grand Total, Public Roads and Rural Engineering	591,557
15. Office of Markets and Rural Organisation—	
(*a*) Administration	52,630
(*b*) Marketing and distribution	257,500
(*c*) Investigations and Demonstrations of cotton standards and cotton testing	59,920
(*d*) Rural Organisation	39,000
(*e*) Enforcement of United States Official Cotton Standards (Research, 50,000, Regulation, 125,000)	175,000
Grand Total, Markets and Rural Organisation ...	273,920
16. Insecticide and Fungicide Board—	
(*a*) General administration	41,361
(*b*) Enforcement of Insecticide Act (Research, 7,500, Regulation, 92,500)	100,000
Grand Total, Insecticide and Fungicide Board...	141,361
17. Federal Horticultural Board (For the enforcement of the Plant Quarantine Act)— Grand Total	144,500
18. Live Stock Production in cane sugar and cotton Districts— Grand Total	60,000

Such are the various bureaus or departments into which the Federal Department of Agriculture is sub-divided, and the sub-headings indicate the subject matter of investigation under each, with the sums allotted for each heading for the financial year, 1915-16.

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Summary.

Briefly summing up, one may say that the Federal Department under the direct jurisdiction of Congress makes itself responsible for the agriculture, and all that is implied in the term—of the country taken as a whole. It does this by the institution of its own experimental stations scattered throughout the country, staffed by Federal Departmental Officers; some of these officers are working in the State Departments in collusion with the States' own officers on problems which have been submitted to Washington and approved and incorporated in the Federal Programme, for which purpose grants are made by the treasury for carrying out the work. Any individual State thus has a direct and active support in working on Agricultural problems which are not limited within its own confines, and thus a systematised policy is pursued throughout the country. Many of the activities of the Federal Department it will be noted are of a legal and controlling nature, to which the separate States are perforce obliged to submit, due regard being paid to their interests, and the place which those interests command in the general welfare of the country.

Apart from these reservations, the State Departments are quite independent, and have entire freedom of action in their own organisation and administration, and pursue their own independent lines of research if they wish, but it is generally found that all the more important problems under investigation are receiving very material encouragement and assistance from Washington, and States vie with each other in the matter of catching the eye of the Federal authorities and receiving their grants.

A special Bureau or States Relation Service is the controlling link between the States and the Federal Department.

SUMMARY OF EXPENDITURE BY BUREAUS.

		Dollars.
1.	Central Administration	812,769
2.	Bureau of Farm Management	266,080
3.	Weather Bureau	1,666,050
4.	Bureau of Animal Industry	8,466,680
5.	Bureau of Plant Industry	2,131,155
6.	Forest Service	6,187,810
7.	Bureau of Chemistry	1,053,743
8.	Bureau of Soils	327,935
9.	Bureau of Entomology	829,900
10.	Bureau of Biological Survey	464,290
11.	Division of Publications	693,500
12.	Bureau of Crop Estimates	283,480
13.	States Relation Service	1,381,840
14.	Public Roads and Rural Engineering	591,557
15.	Markets and Rural Organisation	273,920
16.	Insecticide and Fungicide Board...	141,361
17.	Federal Horticultural Board	144,500
18.	Live Stock Production in Cane and Sugar Districts	60,000
	Grand Total	25,776,570

That is, Twenty-five Million, Seven Hundred and Seventy-six thousand, Five Hundred and Seventy Dollars, which converted into rupees at five Dollars to the £ sterling and fifteen rupees to the £

Represents ... ... 7,73,29,610 rupees.

Oral Evidence.

45,971. *The Chairman*: Dr. Lander, you are Agricultural Chemist in the Punjab?—Yes.

45,972. You have attached to your note of evidence two notes descriptive of the organisation of the Federal Department of Agriculture in the United States of America and its relations with the State organisations; I think the information provided there is the result of a tour that you took in the States?—Yes.

45,973. Is that the only occasion upon which you have visited that country?—That was the only occasion; I spent two months travelling through the States; I went out primarily to investigate certain scientific work, and I also spent a certain amount of time looking into the administration; these two notes embody the results of what I have been able to determine.

45,974. Would you give us a short account of your own training and past appointments?—I was trained at Cambridge and London, following which I spent five years less two months on military service; at the end of that time I was appointed by the Secretary of State for India to the Indian Agricultural Service, primarily with the object of carrying out animal nutrition work. I arrived in the Punjab in December, 1920, and have been in the Punjab since.

45,975. In your present appointment I gather you are not specially concerned with the problem of animal nutrition?—My present appointment is to take over the whole of the agricultural chemistry work appertaining to the department, but I have made myself particularly interested in animal nutrition, and the main activities of the agricultural chemical section are now centred in that direction.

45,976. *Professor Gangulee*: How long have you been engaged in this work of animal nutrition?—I have actually been in the Punjab six years, during ten months of which I was on leave, and I can say that I really took it up seriously after, say, the first two years; that is, from about 1922 onwards.

45,977. *The Chairman*: Have you formed any view as to the modifications which would need to be introduced into the American system, were the general principles of that system to be applied to India?—The answer to that question I think is to be sought in the entire discrepancy of financial resources; there is no comparison at all.

45,978. At the same time, you do recommend that those general principles should be applied?—I very strongly recommend that we should seriously investigate the general principles on which the American system is modelled and endeavour to apply some of those principles to India, in so far as they can be applied with our particular political system.

45,979. Agriculture being now a subject for which the Provincial Governments are responsible, what services do you suggest that the Imperial Government can render which it is not within the capacity of Provincial Governments to perform?—I have stated that the Central Government should more particularly concern itself with lines of research and investigation which concern India as a whole rather than those which are purely of a provincial nature.

45,980. Is it your view that the Central Government might be in a position to offer conditions of service and pay better than Provincial Governments and so be able to attract a different class of research worker; is that at all in your mind?—I had not considered the question of what pay the Central Government might have to offer, but, in considering any appointments to deal with All-India problems of research, pay will have to be offered which will attract the man who is capable of taking up that work.

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45,981. You give your views about the present equipment of the Imperial Department of Animal Husbandry and Dairying at Bangalore, and especially of the animal nutrition section there, on page 747 of your note in answer to our Question 1 (*b*). Is it your view that an enquiry into the problems of animal nutrition might well be linked with enquiries into nutrition in man and nutrition in plants?—I think the whole of the problems connected with condition of the soil, the crops which the soil produces, the welfare of the animals and of men fed on those crops, are linked in a cycle, and that they should all be studied one in relationship with the other.

45,982. Do you regard it as necessary that they should be studied, all of them, in one and the same institution?—I do not think that is entirely practicable; I would suggest that certain branches of the work be studied in one institution; and other branches in others; for example, problems connected with medical and pathological work might be undertaken in a different institution from one which devotes itself primarily to work in connection, say, with farm animals.

45,983. Do you regard it as expedient that one officer should be responsible for research into all three branches of the subject?—I do not think that one officer is capable of making himself responsible for the whole of such a field of work.

45,984. You think that touch should be maintained between the institutions carrying on the various enquiries, but that no one officer need be responsible for correlating the work?—I think provision in the administration is required for correlating the work and co-ordinating it, and it would be rather doubtful to say at the moment whether one officer should be primarily responsible.

45,985. It may be that the answer to that problem would be more evident when the various lines of research have proceeded a little further?—I think we should have to determine first of all what branches of research were going to be undertaken, and not until that was done could we determine and settle the staff that would be required.

45,986. I am thinking now of the limited field of research connected with nutrition in man, plant and beast?—Yes.

45,987. You mention on page 747, in answer to our Question 1 (c) (iii), that you think that the Fruit Specialist's work in the Punjab should be developed. Have you anything in particular that you would like to say on that matter?—I was thinking of the development of the Fruit Specialist's work more particularly with regard to developing a fruit canning and preserving industry. It is noticeable that a tremendous amount of foreign tinned fruit is imported into India, and I think we should ultimately move in the direction of producing such materials ourselves.

45,988. Has it occurred to you that before much more is done in the direction of production, some survey of the markets should be undertaken?—I think that a survey of the markets of any industry is a preliminary to the development of such an industry.

45,989. Do you know the history of the fruit growing and preserving experiment in the Presidency of Madras?—I have never studied it.

45,990. Have you considered the future of post-graduate training for research workers in India?—I think all the Indian members of the Agricultural Service, or those who intend to occupy the higher posts in that Service, should preferably undertake a course of post-graduate training, preferably abroad.

45,991. Would you not rather see the post-graduate training in this country so improved, if improvement is required, as to make it possible for the course to be taken in India?—I should prefer to see training institutions

sufficiently developed in India to give a much wider sphere of train... think at the present moment students derive more advantage from visiting colleges and institutions in Europe and in America than they would in India.

45,992. You have suggested at various points in your note a strengthening of the Imperial Department of Agriculture and of the research departments under the Central Government; do you look forward to the Central Government providing facilities for post-graduate training?—To a certain extent. With any possible increase of the facilities of the Central Government such as I have outlined in my report on America, there should be ample facilities for giving complete and exhaustive training in all branches of agricultural science.

45,993. At one centre or at several centres?—I am not in favour of too intensive a centralisation; I think it would be better to scatter such institutions throughout the country rather than have them all localised.

45,994. So that the best qualified teacher in one subject might be, let us say, at Pusa, and in another subject at some provincial college?—Quite.

45,995. It does not much matter where the man is as long as he is in India and the facilities for teaching and carrying on research work are available for him; is that the idea?—Quite, and provided the institution is so located as to be in the most favourable situation for the particular type of work which is to be undertaken.

45,996. Do you recommend the creation of new research institutions under the Central Government in other parts of India, or would you rather see such research work as is carried on by officers of the Government of India carried on at Pusa?—Pusa exists at present, and its work there should continue and develop; but I see no reason at all why other institutions should not also be started, and I favour the creation of a First-Grade Research Institute in Northern India, in the Punjab say.

45,997. Would it be feasible, do you think, for the Government of India to finance, either wholly or in part, professorships held by teachers working at provincial institutions?—I think so, and there should be collaboration between the Central and the Provincial Governments; each case would have to be determined on its merits, dependent upon the importance to the provinces of the respective pieces of work on which the central officers would be engaged.

45,998. What are you thinking of on page 750, in answer to our Question 4 (c) (1), when you say great caution should be exercised to guard against any tendency which might lower standards and efficiency?—What I had in mind was that officers being appointed to the Agricultural Service under the terms of the Lee Commission should have every facility to study abroad; it is particularly that question of study abroad which I had in mind; they should not be satisfied with merely following what is going on in India, but should endeavour to keep in touch with the latest scientific research work in other countries, so as to avoid a too static or indigenous outlook.

45,999. On page 750 of your note, in answer to our Question 9 (b-i) you deal with the problem of the reclamation of alkali soils. Have you had these problems in hand?—I have.

46,000. And also the problems of the *bara* lands?—Yes.

46,001. I see that you think that whereas the reclaiming of alkali land is probably a commercial proposition, you are not so clear that that is the case with the heavy *bara* land?—No, the two cases present quite different problems.

46,002. And the *bara* land is much the more expensive to reclaim, is it not?—At present *bara* land has proved extremely intractable, one cannot

yet express a definite opinion, but it is doubtful whether *bara* land is reclaimable within such a period of time and at such expenditure as would render such reclamation an economical proposition.

46,003. Then you cite some land lying along the Upper Jhelum Canal, near the salt range, as an instance of progressive deterioration. Do you form the view that waterlogging and the consequent deterioration of the soil in certain irrigated tracts in the province is likely to be a very serious problem in the future?—I think it is; I have not studied the problem intensively, but that particular remark of mine was based on a tour which I made in that region about four years ago, and from the information which I was able to get from the zamindars it was perfectly clear that much of the land in that district had deteriorated very considerably owing to seepage from the canal. That was being accentuated to a certain extent by salt washed down from the Salt Range.

46,004. That was a special problem?—That was rather a special problem, but the question of seepage from canals is a very definite one, and I think it is very definitely maintained that deterioration of land follows as a result of such action.

46,005. What is it that comes down? It is ordinary salt?—A mixture.

46,006. But that is washed down from the mountains?—That particular salt is ordinary common salt.

46,007. And that is really a different problem altogether, is it not?—It is rather a different problem, yes. One found in the Salt Range, I do not know whether the practice still maintains, that large quantities of waste salt were thrown out on to the adjacent land and subsequent rains took most of that salt down into the fields below.

46,008. On page 751, in answer to our Question 10 (e), which deals with fertilisers, you say: "In dealing with nitrates, it is interesting to note that land which has been for a very long time under wheat does not show any appreciable deficiency in total nitrates, due to the natural ability of the soil organisms to fix nitrogen from the air. The vitality of these organisms is greatly enhanced by the presence of organic matter or farmyard manure." Do you attach great importance to the power of the sun in India in this connection?—The sun undoubtedly is a very potent factor in the question of nitrogen fixation, but there are, undoubtedly, other factors which have not yet been sufficiently determined. Here in Lyallpur, we find that the nitrogen fixation takes place to an extraordinarily high degree about July and August, and that very shortly afterwards a large percentage of that nitrogen is again lost.

46,009. Have you enough rainfall here to account for that loss?—The rainfall here is very small.

46,010. It is seven inches, is it not?—It is only an average of 12 or 14 inches per annum.

46,011. Is that enough at that season of the year to account for that loss?—This cycle of fixation and loss has been noted in many other different parts of the world. How far that deficiency of rainfall may account for the loss I am not able to say, but the problem is to fix that nitrogen in the soil permanently, and so far nobody has yet been able to deal with it with success.

46,012. I had thought the theory was that the rain washed the accumulated nitrates down into the subsoil, so that the more rain, the greater the loss?—I do not think that 12 inches of rain, spread over the period through which it falls in Lyallpur, is sufficient to wash that quantity of nitrates down.

46,013. Which means that those who attribute that loss to heavy rainfall at that season of the year live in error?—I think they do, if you take the rainfall of Lyallpur as the criterion of such action.

46,014. And yet here, in this district of Lyallpur, you find the same loss at the same season of the year?—Yes.

46,015. Are you of opinion that a great deal more research requires to be done into this question of fertilisers and their economic use, before firm advice can be given to cultivators?—I think so; at present the advice which we have to give them as far as our experiments in the Punjab go is rather of a negative nature.

46,016. On pages 751-2, in answer to our Question 16 (*b*) on animal husbandry, you give your views as to some aspects of the problem of providing sufficient fodder to carry the cattle through the season of shortage; do you know whether propaganda directed to encouraging the cultivator to experiment in the making of silage is being carried on in this Province?—I am not able to say to what extent the production of silage is being recommended.

46,017. So that, when you say that you recommend the establishment of large reserves of silo and green fodders in those districts which are likely to experience drought, do you mean that your department or some other department of Government should undertake the work?—I have in mind that there are certain districts which are, or might be, liable to famine, and to get over the difficulties produced by such famines, I would recommend that it should be usual to keep definite reserves of fodder which would be available and could be replaced from year to year.

46,018. They would be made by Government?—Yes, under Government auspices.

46,019. And would the same apply to the making of hay in the forest areas and the preservation of *bhusa* through one or two years?—I think it would; if you are going to have a reserve of green fodder it is necessary also to have a reserve of hay.

46,020. Do you know at all how long *bhusa*, if properly stacked, will keep in this country?—I was looking at some *bhusa* stacks last week, one of which had been stacked for one year and the other one for two years; there was a noticeable difference in their appearance, but I have got no analytical data from a scientific point of view.

46,021. Will the animals eat the two years old *bhusa*?—Yes.

46,022. So that as a means, at any rate, of preserving life, presumably the two years old *bhusa* would suffice?—I take it there would be practically no deterioration in its feeding value from the first to the second year.

46,023. *Sir Ganga Ram*: Will it keep more than two years?—I should only like to answer that question on definite experimental evidence, but I see no reason why it should not if properly stacked.

46,024. *The Chairman*: On page 752, in answer to our Question 17 (*d*), you are dealing with the oilseed industry, and amongst other things you suggest that the making of, shall I say, artificial *ghi* might be encouraged in this country?—I think it should.

46,025. You are a student of the problems of nutrition. Can you tell the Commission whether *ghi* made from oilseeds contains the essential elements which are supplied by natural *ghi*?—One has to look at that question from two points of view; from actual feeding values as determined analytically, and from a calorific aspect, the two are of practically identical value, but the *ghi* produced from butter is much richer in essential vitamins than is the *ghi* produced from vegetable oils or fats, and if the whole of the butter *ghi* is going to be replaced by a vegetable oil *ghi*, care would have to be taken to ensure that the consumers of such *ghi* obtained the necessary vitamins from other sources.

46,026. Do you think that is a practicable policy?—That is a question which would have to be thoroughly investigated; it is a scientific problem

and I cannot definitely answer it now. All I can say is that these two types of *ghi* show considerable difference in the vitamin content.

46,027. Is vitamin "C" held to be present, in *ghi* made from oilseed?—To a certain extent.

46,028. On pages 752-3, in answer to our Question 20 (*a*), you tell us that you have interested yourself in the problem of marketing, and in particular in the market for oilseeds and manufactured products. Were you able to turn to any authoritative work or data written or prepared by other persons, or had you to carry on this survey *de novo*?—This survey was carried on practically *de novo*, and such remarks on marketing as I have embodied in my report on the soil tour are those obtained from conversations with the heads of certain firms in Calcutta, Madras and Bombay.

46,029. Would you like to see a complete and exhaustive enquiry into this problem initiated?—I should.

46,030. Has it occurred to you that the problems of the oilseed industry as a whole, embracing those of the producer, those of the distributor and those of the manufacturer, might be watched over by some such body as the Indian Central Cotton Committee for cotton?—I think such a body formed to supervise, and in some degree control, an oil industry in India would be productive of great benefit. At the present time there is no such control in the oil industry, and this industry, when compared with, say, jute and cotton and other corresponding industries, is in a most chaotic and unsatisfactory condition.

46,031. Are you familiar with the existing prices and the existing demand for oil from Indian oilseeds and other seeds?—The prices vary from day to day and from week to week and can always be obtained from "Capital." The demand varies also, and one can only give a definite answer to your question by a continuous application to the problems which the oil industry raises. I have given such information as is available to me in my report, and I have endeavoured to show that the demands are of a very variable nature.

46,032. Have you heard it suggested that any substantial increase in the production of oilseeds in India would so glut the market as to reduce prices below the profitable level?—In Calcutta, that was the general trend of feeling with regard to any contemplated extension of the oil industry.

46,033. Have you any views of your own on that aspect?—I entirely sympathise with that view. The remedy is to find increased markets for the oilcake produced and for the oil. At the present time in India it is doubtful whether, unless we have intensive propaganda, any considerable increase could be utilised; but I see no reason why, with a progressive agriculture, further oilcake should not be used and, with proper education of the masses, we should not be able to produce a vegetable *ghi* which should supplant the vegetable *ghi* which is imported into India from Holland and France, produced from oilseeds exported from India.

46,034. On page 755, in answer to Question 23 (*b*) of the Questionnaire, you say: "Generally speaking, I consider that rural education must follow and not precede a general amelioration of the lot of the agriculturist." Do you include primary education up to the point of literacy?—No, I exclude that entirely.

46,035. With regard to your journey to the United States of America, did you find the Federal Department popular in the States?—It was extremely popular, because many of the grants given to the State Departments of Agriculture depended on the amount of work which was done by those States in collaboration with Washington.

46,036. No doubt you met many individual research workers and teachers in the agricultural colleges?—I did.

46,037. Had they a good word to say for the Federal Department?—I did not hear anything derogatory.

46,038. Have you ever heard anything derogatory of Pusa in an Indian provincial agricultural college?—I do not think I have, except in so far that it is too provincial in outlook, that it requires to be very much larger than it is, and to stretch its tentacles very much further.

46,039. Do you think that research workers in India look to Pusa at this moment as the centre of research activity in India?—I find it very difficult to answer that question in the affirmative.

46,040. Do you think that research workers employed by the States in the United States of America look to the Federal Department as the leader in research?—That again is difficult to answer, because many of the State Departments have organisations which are extremely efficient themselves, and it is extremely difficult to compare, say, the best State Departments with, let us say, the Federal Department at Washington; the problems and the nature of the two are somewhat dissimilar.

46,041. *Sir James MacKenna*: You have told the Chairman that you were appointed to the Indian Agricultural Service as a Chemist, especially with reference to animal nutrition work. Was there any such post in the Department of Agriculture at the time that the Secretary of State appointed you, or did he appoint you generally as an Agricultural Chemist to the Agricultural Department?—When I was appointed in London, I was told quite definitely that I was to proceed to Madras to undertake work in animal nutrition; I am not sure that I am correct, but I believe that there are existing papers to that effect.

46,042. How did you come to find yourself in the Punjab as Agricultural Chemist?—Acting on instructions received when I landed in Bombay.

46,043. It looks as if you had been appointed to a particular post on animal nutrition in Madras?—I think that is correct.

46,044. Did you spend any time in Madras?—None at all.

46,045. Having come out for that very definite line of research, how do you find it fits in with the multiplicity of other duties which you have to perform as an Agricultural Chemist of a Province?—It is extremely difficult to fit it in.

46,046. Do you make it the one particular special line of research on which you can concentrate in the midst of your other duties?—Yes, that is so.

46,047. Was there another Agricultural Chemist in the Punjab when you came here?—I succeeded my predecessor, Mr. Wilsdon, who was about to go on leave.

46,048. Reverting to this idea of a school of nutrition, do you think there would be any difficulty in constituting an Imperial School of Nutrition in India, although workers might not all be working in the same Province or under the same roof?—I think we require a consolidated policy, with very definite lines of research laid down as to what we are really trying to get at in the field of animal nutrition.

46,049. Do you think it would be possible to devise some scheme by which all workers on nutrition could be more or less attached to a school of nutrition, although they might not all be working together?—I think it would.

46,050. At present they are all very isolated: you are in the Punjab and there are various scattered workers in the South of India?—I think at the present time there are only three workers in the field of animal or human nutrition.

46,051. Colonel McCarrison, Dr. Warth and yourself, I suppose?—Yes.

46,052. Do you accept responsibility for the views of your friend, the oil mill manager, whom you quote on page 754; I do not quite follow that "India, on the other hand, places a tax on the importation of raw material." Do you know what he meant by that?—I cannot say what he had definitely in mind.

46,053. I do not suppose you understand the next two sentences with regard to a duty on manufactured articles, and with regard to freightage?—What that is meant to convey is that if, instead of buying foreign manufactured *ghi*, he could buy *ghi* which was produced from oilseeds crushed in India, he would get it cheaper.

46,054. Can you give me an equally lucid interpretation of the reference to the saving of freightage?—You would save freightage on the oilseed to Europe and you would save freightage on the oil back again.

46,055. Are you interested in any other agricultural products from the chemical side? Have you gone into the sugarcane question here?—Only in so far as the investigation of main types falls within the programme of the Agricultural Chemist's work.

46,056. Have you any information as to how the Coimbatore canes compare from a chemical point of view with the indigenous ones?—I have got a large number of analyses; I could let you have any figures you want.

46,057. Have you a general recollection of how they stand?—They compare very well.

46,058. Then, from the sugar point of view, you would consider their introduction a distinct advantage to the Province?—Yes.

46,059. Have you been able to do any work on fodders? That is closely allied to your nutritional problems?—I have done a considerable amount of work on fodders, which comprises determination of digestibilities of fodders. I am working at the present time on determining maintenance rations for various types of animals, such as heifers and cows. I have also another rather large investigation in hand which involves the comparative analyses of different soil types in the Punjab, with corresponding analyses of the crops produced on them, chiefly with a view to determining what mineral ingredients are contained in those crops and to what extent croppings deplete the soil of plant food materials.

46,060. Is your work overlapping Doctor Warth's work at all, or are you in close touch with him?—I am in quite close touch with him, and I do not think we are overlapping.

46,061. *Professor Gangulee*: Have you and Doctor Warth come to an understanding with a view to adopting the same technique, so that your results may be comparable?—You mean the technique of chemical analysis?

46,062. And also sampling urine, and other methods which you have to adopt in animal nutrition work?—I cannot say we have had any correspondence on that subject or framed any uniform system.

46,063. Do you think a uniform system or some sort of standardisation of methods would be useful?—I think it is very essential that in any particular country different workers should employ the same methods, so as to obtain consistency in results.

46,064. Are you quite satisfied with the facilities that you have here for carrying on the investigation in which you are engaged?—I am not.

46,065. Have you adequate laboratory facilities?—I have adequate laboratory facilities, but I have not adequate facilities for the provision of the necessary animals and their general welfare.

46,066. On page 747 you refer to the state of affairs in the Imperial Department of Animal Husbandry and Dairying at Bangalore, and you describe

that state of affairs as being ludicrous. What have you exactly in mind?—I was recently discussing the subject with Dr. Warth, and we mutually agreed that his facilities for doing his research work as the Imperial Physiological Chemist were utterly inadequate; he asked me to impress upon the Commission as far as I possibly could that that was so.

46,067. He requires more equipment and more investigators to help him?—More equipment, more laboratory accommodation, more investigators and more animals.

46,068. You have, I take it, a well equipped laboratory here. Could you tell us whether the work commenced by the late Doctor Barnes on alkali soil is being continued?—Practically no.

46,069. That work has stopped?—The *bara* work is still being continued, but we have no systematic plan of investigations being carried on at present on alkali soils.

46,070. So that that work on alkali soils has had to be discontinued with the death of Doctor Barnes?—It was carried on to a small extent after Doctor Barnes' death by my predecessor, but we are doing very little in that direction at present.

46,071. Is the work of your predecessor, Mr. Wilsdon, being followed up?—No.

46,072. Have you a number of assistants under you?—I have about eight or nine.

46,073. Are you satisfied that they would be able to continue the line of research you are engaged in, should you have to leave the institution to-morrow?—I am not at all satisfied that, if I left to-morrow, my work would continue.

46,074. So that there is no continuity of research in this institution?—At present there is grave danger of discontinuity with the removal of any particular officer.

46,075. Would you not say also that there is a lack of definite policy with regard to research?—I think we require considerably to improve and consolidate our main lines of research under a definite research policy.

46,076. We have had divergent opinions on the importance of soil survey; what is your view on that question?—My views are that a sufficiently systematic and intensive soil survey would bring to light much information of value, but any sort of survey carried out in the Punjab should be carried out district by district. I was recently contemplating endeavouring to initiate such a survey in the Nilibar District, but I came to the conclusion that if the whole of my staff were doubled and put on such a survey, we should not be able adequately to attack the problems.

46,077. It is a vast problem? Would you ask the Central Government to carry on that work, or should it be done by the Provinces, each Province doing its own survey?—I think each Province should initiate preliminary investigations into its soils.

46,078. You do not advocate the system adopted in the United States of America where the Soil Bureau undertakes the survey?—That would be an extremely expensive undertaking and I doubt whether the Central Government would be prepared at the outset to conduct such a survey on an elaborate scale but, with the development of the Central Department's activities, a Bureau of Soils could be built up on the American pattern, supplementing what the Provinces had started and working in conjunction with them.

46,079. So that your view is that each Province should undertake its own soil survey?—For the moment I think that is the most likely way of starting

investigations on the soils, with the proviso that it develops into an All-India problem of enquiry into the soils of India, with relation to the crops grown and the health conditions of the people. I regard this as an instance where the Central Department could lend workers to work in co-operation with Provincial Departments, but the magnitude of the problem would necessitate a development from small and workable by mixings.

46,080. We are told that agricultural research should be associated with the Universities of the country; what is your view on that point?—What precisely do you mean?

46,081. That all our agricultural research should be linked up with the Universities?—I think the creation of the necessary research atmosphere is very desirable and agricultural research in all its branches might very well be conducted in close collaboration with University activities. We frequently find ourselves faced with highly technical problems which we want thrashed out, and which we have not either the time or the staff to deal with.

46,082. So that intimate touch with the Universities is helpful?—It would be distinctly helpful.

46,083. In order to create the research atmosphere that you desire to create?—The creation of a research atmosphere in any institution depends primarily on the workers in that institution; but collaboration with a University would considerably tend to augment such an atmosphere. I also wish to emphasise that in my opinion, the location of any new Research Institutes should not be in too isolated and inaccessible positions, where such can be avoided, as such tends to minimise the creation of the proper atmosphere, or to restrict intercourse.

46,084. What is your view on the question of the development of Pusa as a post-graduate institution for advanced agricultural research?—Are you asking me whether I would prefer to send graduates to Pusa or to Cambridge?

46,085. No, but whether you would like to develop Pusa as it is to-day into a well-equipped and advanced post-graduate institution?—I certainly would.

46,086. So that when it was developed to that extent you could send your graduates there instead of to Cambridge?—Yes, but I would not try to obviate the necessity for students to go abroad.

46,087. At the same time, you want a post-graduate institution of a higher order in India?—We do.

46,088. Do you think the affiliation of Pusa to a University would be an attraction to post-graduate students?—I should like to study that problem before giving a definite answer.

46,089. A degree has some attraction, even for research workers?—Yes.

46,090. What is the function of the Federal Department of Agriculture in Canada?—I spent a very short time in Canada, and I did not study the situation there as thoroughly as I did in the United States. I should say the Canadian Federal Department, of which the headquarters are at Ottawa, is more comparable with the corresponding organisation in India, but rather better organised.

46,091. That was my impression. Do you think we could have a system of experimental stations such as they have developed there? The central station there is controlled by the Federal Department, and there is a number of other stations under the control of that department?—Yes.

46,092. It is often asserted that the oil industry could be developed in this country as a cottage industry?—I have made the remark in my book that in the development of any industry, such as the oil industry (which should be a big one), India must adopt the methods which other countries adopt. It is rather doubtful whether the development of the oil industry as a cottage

industry would enable India to compete with corresponding industries abroad.

46,093. In that connection, you suggest, on page 752, that if Government could establish industries which would keep both the oil and the cake in the country for consumption which is badly needed, a great result would have been achieved. Do you want the Government to start factories, or a Government subsidy?—What I am referring to is the fact that there is a tremendous loss of mineral and organic material from Indian soils as the result of the export of oil seeds. If we could crush more seed in the country and utilise the cake for feeding and manurial purposes the soils would benefit.

46,094. Undoubtedly, but do you want that industry to be started by Government or subsidised by Government?—Most large industries in India have been started independent of Government, but if no such development is imminent in the oil industry I see no reason why Government should not take the initiative.

46,095. By providing research material and so on?—Yes, I want someone to take the initiative; either Government or private firms acting with Government assistance.

46,096. From what you say in your note, I thought your idea was that Government should take this up?—I should like to see Government do so, but not necessarily as a Government monopoly.

46,097. You would have the oil industry in this country developed as a State industry?—Not necessarily, but at the present time it is in such a chaotic condition that somebody ought to make a move, and I suggest it should be Government.

46,098. I understand you are in favour of raising the standard of admission to this college?—Yes.

46,099. From matriculation to intermediate?—Yes.

46,100. That would, of course, shorten the course by one year?—Yes.

46,101. Do you think that would be attractive?—I am looking rather at the defects of the present arrangement. When students enter an agricultural college, the instruction in which should be essentially of a technical and professional nature, they ought not to spend too much time doing elementary work; that should be done before they enter.

46,102. Do you approve of the principle followed in admitting students, the statutory definition of agriculturists?—I think that definition is rather empirical.

46,103. Do you think an institution like this should adhere to that sort of statutory definition of agriculturists? Should it not open its doors to anyone who knocks?—An agricultural college having as its object the training of men destined to improve agriculture should admit anyone who sincerely wishes to take up the profession of agriculture, whether he comes under an empirical definition of what is an agriculturist or not.

46,104. When a student presents himself for admission, you might make inquiries as to whether he has any land or not and whether he intends to become an agriculturist or not; that is different; but if you bind yourselves to follow a statutory definition I think you jeopardise the expansion of agricultural education?—You probably do.

46,105. *Mr. Calvert*: Would you impose no limitations at all in that respect? Would you have no limitations based on caste prejudices and the sentiments of the people?—It is very hard for a man who wants an agricultural education to be debarred from it because he is classified as a non-agriculturist.

46,106. How do you think you could train a Jain to kill insect pests?—I do not know.

46,107. If a Brahmin objects to drawing blood from a cow, how can you persuade him to inoculate it against disease?—Education or training will perhaps solve the difficulty.

46,108. On this question of a possible oil industry, what do you think would be the best way of getting over the difficulty of a suitable container?—The Tata oil mills seem to favour barrels as being much better than kerosene tins.

46,109. Are they made of Indian wood?—No, of metal.

46,110. The Tata mills are not far from the sea; practically on the coast. Metal barrels would be a difficulty in the Punjab, a thousand miles from the sea?—Yes.

46,111. Is there any evidence of a difference in the nutritive value of foods grown on different soils in the Punjab?—I am at present carrying on some work in conjunction with Colonel McCarrison, of the Pasteur Institute at Coonoor, in which I am determining the mineral contents of different wheats grown on different types of irrigated land. Colonel McCarrison is determining the vitamin values of the same wheats, and the results of the experiments he has so far done are inconclusive, and he proposes to repeat them. I cannot, therefore, give a definite answer to your question at the moment.

46,112. For a man who intends to farm or become a manager of a large estate (as distinct from those who wish to become teachers of agriculture or Government servants), do you think the amount of chemistry taught in this college is excessive?—That is, the chemistry which a man takes up to his F.Sc. No, I do not. I think every man who is going to occupy the position of farm manager or something corresponding to it ought to have at least the chemical knowledge necessary for the F.Sc. standard, and it would be better if he could have considerably more.

46,113. *Mr. Kamat*: Referring to the Jains, are you aware there are a good many medical graduates amongst the Jains who do all sorts of dissection work on man or animals when necessary?—I was not aware of that.

46,114. In other parts of the country there are; you may take that from me. Are you also aware that, in the Veterinary Service, there are Brahmins who inoculate animals with serum and who do all kinds of veterinary work?—I have not been brought intimately into contact with that, but I know there are Brahmins in my own section who do every type of work I require in connection with my present work on animal nutrition, without any demur whatever.

I am very glad to hear it. It shows that if the classification of agriculturists and non-agriculturists in the Province is based on such ideas, the official mind in this Province is really in need of better study of Indian castes and susceptibilities.

46,115. Speaking of the oil industry, you say you spent a month investigating this problem from one end of the country to the other?—Yes.

46,116. Do you think for a problem of this sort one month's investigation is enough?—No, and I do not think one year would really be sufficient to get an adequate all round knowledge of the oil industry.

46,117. Are you aware that in a problem of this kind, if a private firm were thinking of starting a company with a capital of 50 lakhs (your scheme), one aspect of such a scheme, such, for example, as that of machinery, would alone take them six months to investigate?—This scheme of mine is that of a man who has spent twenty years in the oil industry, and a practical application of that scheme would require attention to the

types of machinery used, which would take some months. The same remark applies to other aspects of the scheme.

46,118. So, you are not prepared to father that scheme?—I am prepared to state that that scheme should be given exhaustive study by Government.

46,119. Although you recommend that the scheme should be taken up by Government, you however suggest that the success of the scheme would be dependent on one or two important factors, the first being that some sort of legislation would be necessary, either by the Government of India or the Local Government, in the matter of the regulation of the purity of food-stuffs. Is that a condition precedent to this scheme?—It would considerably assist any scheme for the development of the oil industry if pure food laws could be enacted to prevent adulteration and if attention could also be given to the question of excise.

46,120. Your second condition, likewise, would be such a revision of the import duties as would give protection to the industry? Apparently that is so.

46,121. In other words, without protection even this scheme, if taken up by the Local or Central Governments, would not succeed?—I would not say definitely that it would or would not, but in Madras I was given statistics of imports of foreign-produced vegetable *ghi* and the names of particular firms who imported that *ghi*, and I was told that those firms are considerably increasing the sphere of their activities in those imports and that they would reduce their prices in any competition they met with.

46,122. Was that told you by Messrs. Ralli Bros.?—No, it was not told me by any of the individual importers that I have mentioned.

46,123. When you visited the Bombay Presidency did you come across any oil mills which were, to all appearances, a paying concern?—The largest and best oil mills I visited were the new ones at Wadala. They are extremely *pucca* mills with very good German machinery, but the situation of those mills today is that they are over-capitalised and have insufficient capital available for working expenses. The whole of the capital available was utilised in constructing the mills, and at the time of my visit they were in process of liquidation.

46,124. Was that due to the fact that they had no protection from a tariff point of view, or was it because they had made a bad start?—The reason appears to be due to the fact that insufficient capital was available for working expenses after the mills were created.

46,125. Did you visit any smaller mills in the Bombay Presidency which, to all appearances, were paying, having functioned for a very long time?—I did, and also in the United Provinces and Madras. Most of those mills are Indian-run, and I think I have adequately described them in my book, and also given the reasons why they do pay.

46,126. That brings me to this question: if they were put on a more satisfactory basis so far as cleanliness and other matters which you mention were concerned, do you think they would not pay?—I think they would probably then pay far better.

46,127. Then there is a category of oil mills, worked perhaps on a smaller scale than the Tata or the Wadala mills, which are paying and which might be made more paying without protection?—Possibly.

46,128. Well then, is protection necessary only in the case of the bigger mills, or in the case of the smaller mills as well?—I think it is necessary to a certain degree for both.

46,129. But you say the smaller mills are paying without protection?—Yes they do, and I have tried to make it clear that they pay because of

the relatively small amount of capital involved and their facilities for disposing of their produce in the local markets, and this in spite of waste, dirty conditions and gross inefficiency in the large majority of cases.

46,130. If the smaller mills are to your knowledge paying, either in Bombay or in Madras, does not that suggest to you and to your department that the real problem which the Punjab (or any Local Government) has to tackle is in the first the question to take up the smaller industry, rather than the bigger industry plus protection?—You mean, the development of the oil industry on a smaller scale?

46,131. Yes, with small mills dotted all over the Province. You say small mills do not require protection and can be run at a profit?—I should make by meaning clearer, the small mills to which I refer are mostly using very antiquated types of machinery and their management is characterised by the waste and inefficiency mentioned, and they pay because in the present state of the oil industry they cannot help paying as they do not meet with any serious competition. I now distinguish between a small mill using very up to date machinery, erected at a cost of some Rs.40,000 such as that at Vizianagram in Madras and the type of mill represented by the Tata Mills which cost some 86 lakhs of rupees. I am advocating the cause of the "moderately" large mill which would eliminate waste and observe efficiency in support of the thesis outlined in my report. While the small *deshi* type of mill does not at the moment experience any effects from the importation of foreign produced vegetable *ghi*, it must be emphasised that these imports are increasing yearly, and in advocating the cause of the moderately large type of modern mill, I wish to draw attention to the danger of increased imports of foreign *ghi* and in that connection advocate a careful examination of the proposal for protection in the early stages of a reorganisation of the oil industry.

46,132. There is one in Berar which I think is paying, and another in Bijapur in the Bombay Presidency, showing that, given the right conditions, the smaller mill can pay and that the line of progress is to tackle the small mills first: do you agree?—I see what you have in mind but in talking of small mills I wish to rule out the small *deshi* type using antiquated machinery, and to develop the larger type of modern mill, and it is with regard to such development that I suggest an examination of protection.

46,133. Now, with regard to the system of Federal organisation in the United States of America, it has been proposed to this Commission that there should be an All-India Central Board of Agriculture with committees for different crops, and that this should be the co-ordinating agency. Have you heard of that scheme?—I have heard rumours of it.

46,134. There is no definite name which has been attached to it or I would have called it by that name; but it has been suggested to us by Government. Under that scheme committees are to be set up on the lines of the Indian Central Cotton Committee. There would be a committee, for example, for sugarcane research, another committee for wheat, and so on, and these committees would work under a central organisation of which, perhaps, the Viceroy would be the patron and the various Ministers members. As between this scheme and the federal scheme you have placed before us, which do you think will be most suitable as a co-ordinating agency?—I think the Federal scheme would be the more suitable, but an admixture of both might be adjusted in so far that certain organisations such as the Indian Central Cotton Committee might develop with regard to some of the staple crops, but such committees would not be suitable to deal with many all-India problems such as soil surveys, animal nutrition, etc. Furthermore a Federal system would become a more integral part of the agricultural organisation of the country than would a number of independent organisations.

46,135. If there is to be an admixture of both, I do not see how your Federal scheme having various bureaux for innumerable things can be worked to its logical conclusion. You say that in the United States they have 19 or 20 bureaux, carrying on research in every little problem. How does that fit in with your suggestion that there should be these *ad hoc* committees also?—Take a Bureau of Soils. That would cover many activities. You might wish to have, say, a committee on fertilisers which would deal with that particular aspect of the soil problem. You would want the activities connected with fertiliser companies combined with a Central Government Bureau of Soils.

46,136. You say that, in the United States, the Federal Government has numerous experimental stations for research throughout all the 32 States, and that officers of the Federal Government are deputed for work in the various States with the permission of Congress. If that were to be done here do you think that, in view of the present constitution, it would work?—I do not think the present financial position of India would permit of any such extended scheme as there is in the United States, but I would like to see the principle given effect to.

46,137. *Professor Gangulee*: Your suggestion is not to have a multiplicity of bureaux but to start a small nucleus from which bureaux may develop?—Yes.

46,138. *Mr. Kamat*: I was wondering whether the principle would fit in with the present constitution. To take a concrete example, take the question of rice. You wish the model of the United States to be copied, and you would want the Government of India to depute one of their officers say to the Bombay Presidency and have two or three centres there for rice research, similarly two or three in Madras and in Bihar, for example. That is the effect of your suggestion?—In the case of a crop like rice, it would depend on whether Provincial Governments had the necessary facilities for providing the men themselves. Madras at present has an officer deputed for work on rice.

46,139. You would not send a Government of India man there?—It might not be necessary.

46,140. That applies to Bombay also?—It depends entirely on whether Bombay can meet its requirements itself.

46,141. Generalities always look well on paper, but it is sometimes different when you proceed to particulars?—I agree.

46,142. I am trying to find out, in the light of a concrete case, how far your principle could be carried out. It boils down to this: you neither want the model of the U.S.A. of the Bureaux nor do you suggest that the number of men deputed by Central Government to Provinces should be on the same scale as there, so that virtually then it comes to what the Government of India is practically doing now?—I want to see the principle embodied in the United States system applied to India in so far as the discrepancies in financial resources permit, and I do not suggest that the number of men deputed should be on the same scale as there for the simple reason that such a scale would be impossible, but I do wish to see the Central Department develop its resources for research, the range of its activities, and a system for lending assistance and guidance in working out all India problems in collaboration with the provinces to an extent which it in no wise can be said to do to-day.

46,143. Where is the difference? The Government of India at present has certain experimental stations and certain Imperial officers?—Yes, but they are quite inadequate, and the necessary administrative machinery is lacking.

46,143A. And they can go round the country?—Yes.

46,144. On a small scale they are practically doing what you suggest at present. What is it you want to see developed? Take your own Province; what do you want done here under your scheme by the Government of India?—An exhaustive examination of research problems would reveal that there is room for the establishment of a "Pusa" in the Punjab, and there is also room for the establishment of a Federal Institute of Animal and Human nutrition in its widest sense, and all Northern India problems would be engaged upon. The establishment of these would fall within the purview of the system to be set up gradually in the Central organisation, and both Provincial and Central Officers should be available in the same institution. Our own problems could thus be correlated with similar ones in other provinces so that we can get a connected picture of any particular line of investigation.

46,145. Taking wheat as your problem, how many officers of the Government of India would you expect here?—There are very many problems which could be worked out on wheat.

46,146. You want the same officers to go to the United Provinces?—Not necessarily the same ones.

46,147. For correlation?—You would work in contact with them, but the officer who was working in the Punjab on Punjab wheats would not necessarily work in the United Provinces also.

46,148. *Mr. Roberts*: Where your object is to train an agriculturist who is going back to his own land, would you consider a vernacular course sufficient?—It depends to a certain extent on the initial education of the man concerned.

46,149. I am thinking of a man who farms 40 or 50 acres?—I think a vernacular education would be more suitable in his case, because, if you gave such a man a degree education and he possessed only 40 or 50 acres, his tendency would be to seek employment in another direction.

46,150. Do you consider the present position here, where all, or practically all, your graduates go into Government service, is a healthy one?—I think such an attitude of mind is rather divergent from the *raison d'être* of an agricultural college.

46,151. Do you think it would be healthier, from the point of view of the development of the department (quite apart from the provincial point of view) if you were able to make a selection in your appointments, and did not have to appoint everybody?—Yes. I think the general impression of the student on taking his degree here is that he has some definite claim for a Government appointment.

46,152. In that way also you lose any possibility of students taking up other lines of work in agriculture?—Yes.

46,153. You are definitely in favour of students coming in at the intermediate stage, I think?—I am, in so far that I would like to see a greater facility in the students in their earlier years to assimilate what is being taught.

46,154. You think Lyallpur could be more profitably developed in the direction of advanced studies and post-graduate research?—I think we should pay more attention to advanced studies in the one direction and vernacular instruction in the other.

46,155. In principle, there is no necessity for having the vernacular instruction at Lyallpur, is there?—I do not see the necessity for concentrating the whole of the vernacular instruction in Lyallpur.

46,156. Have you any experience of the storage of green fodder in silos for a long period?—Not for a period longer than two years.

46,157. A silo was opened the other day in Renala which was in perfectly good condition after five years. Would there be likely to be much deterioration in that period as a rule?—One could only answer that definitely after an examination of the silage. I have opened pits of my own after two years in which the silage was practically as good as it was when put in, from a nutritive point of view.

46,158. I raise this point in connection with fodder storage in tracts liable to famine. Only occasionally are there years when there is excess fodder which could be stored in this way, and if it could be stored for three or four years, it would be a distinct advantage?—I think it would. We should investigate the changes which take place in silage kept for a considerably longer period than any we have tried up to the present.

46,159. With regard to your federal idea of Central Government help, I think one of your main points is that Provinces should be able to look for guidance in a particular line of research to the Central Government?—Guidance and assistance.

46,160. You would like such assistance on your own special subject of animal nutrition?—Yes.

46,161. *Sir Ganga Ram*: During your visit to America, did you study the question of dry farming?—No.

46,162. That would be particularly applicable to some districts of the Punjab?—It would.

46,163. I gather the chief thing they have tried to produce is new kinds of seed. You have not carried out any investigations in that respect?—No.

46,164. Did you study in America, their system of distribution of water?—No. My studies were confined to scientific work on animal nutrition and to administration.

46,165. Have you visited Spain?—No.

46,166. They have a special system of water-distribution there?—I am not acquainted with it.

46,167. With regard to the expansion of the oil industry, you have first of all to find channels for the utilisation of the oil. Have you thought of thickening the oil to such an extent as to make it suitable for use as axle-grease on railways?—A large quantity is used by the railways at the present time for lubricating purposes.

46,168. But not for axle-grease?—I do not think so. It would have to be partially solidified for that.

46,169. You have not made any investigations of that kind?—No.

46,170. You have no knowledge of what the hydrogenation of oils costs, and to what thickness you can bring them?—They can be brought to the consistency of a hard fat.

46,171. I had investigations made by the University, and they told me they could be made as hard as a brick?—They can be made extremely hard, but the degree of hardness depends on the temperature, of course.

46,172. Do you know we import certain hydrogenated oils for the lubrication of machinery, such as ginning machinery?—I am not acquainted with that.

46,173. The first industry which ought to be looked to for the expansion of a demand for oil is the paint industry?—It uses an enormous quantity of linseed oil, yes.

46,174. Have you found that proximity to *kankar* in soils has a deleterious effect on the crops? How far does that injury go? What happens if the

kankar is within a foot or two?—One has had experience of different types of *kankar* in Lyallpur and other districts.

46,175. In Lyallpur, there is no *kankar* worth speaking of. In the Amritsar district, however, it is within a foot of the surface?—I have not studied it there.

46,176. Have you made any investigations into the use of sulphate of lime, of which enormous quantities are available at the foot of the hills?—We have been using sulphate of lime for the past ten years to reclaim *bara* soil. Considerable improvement has been effected in such soil, but, as I have already said, it is extremely difficult to say whether it is an economic proposition.

46,177. They are using it in Bombay and buying it at Re.1/- a maund, whereas we can get it here for 2 or 3 annas?—I have recently had communications from a chemical firm in Calcutta advocating the use of calcium chloride for *kallar* soils.

46,178. Are you aware that artificial *ghi* is used not for eating but for adulteration? One-third of it is mixed with two-thirds of pure *ghi*. Would you support the idea of legislation to prevent such adulteration?—I should support legislation to discriminate between pure and adulterated *ghi*.

46,179. Artificial *ghi* is mostly imported for purposes of adulteration?—That is quite possible.

46,180. Have you made any further investigations in regard to jute in this college? We can grow jute here; some was grown in my village some time ago, but we did not know the system of retting?—I have done nothing at all on jute.

46,181. *Sir Thomas Middleton*: You describe as entirely inadequate the provision made for the study of animal husbandry at Bangalore. Can you say offhand how many first-rate nutrition laboratories there are in the United States, or, if not, can you tell us how many you visited?—I visited some half dozen.

46,182. Can you give us some indication of the size of any one of them, and tell us how many workers were employed there? Take any one you like?—One which is very prominently in my mind is the Pennsylvania station. I should have to look up the data to give you the number of workers employed, but it is considerable.

46,183. At any rate there would be more than five, the number employed at Bangalore?—There are many more, and a point I would like to emphasise with reference to your question is that whereas the Imperial Department of Animal Nutrition at Bangalore has the Head of the Department, one Senior Assistant and three Junior Assistants, it is usual to find in corresponding Institutions in the States from a half a dozen onwards, senior specialists not counting the routine workers.

46,184. On what scale are the laboratories?—There is a very large laboratory. It is probably the best laboratory of its kind in the world, and is the home of the classical experiments of Armsby. It draws visitors from all over the world.

46,185. Do you know what its resources are in money?—No.

46,186. Does the laboratory occupy as much space as Lyallpur colleges?—The animal nutrition laboratories are quite distinct from the chemical Laboratories of the Agricultural Station, and perhaps do not occupy as much actual ground space as the whole chemical laboratories here, which are all on one floor. Both these laboratories and those of the Agricultural Station are attached to the University of Pennsylvania in the same "campus." It is not easy to effect comparisons, because take again McCollum's Nutrition Laboratories at the Johns Hopkins University,

Baltimore; these are extensive with several floors, and a number of highly skilled experts solely engaged on very special lines of work, to which they devote their entire time, and are in intimate association with the University.

46,187. How is it off for experimental animals?—They have their own herds. When I visited the nutrition laboratories at Washington and Boston, I was particularly impressed by the fact that the workers there had their own independent herds of animals and their own staffs to deal with them, so that they were quite independent of outside influences.

46,188. Can you give us any indication of the number of animals they had to draw on for their experimental work?—I cannot give you the exact numbers, but I should say fifty or a hundred. They had anything they wanted, as a matter of fact.

46,189. On page 748 of your note, you say greater facilities should be afforded zamindars for seeing demonstration farms. Could you expand that idea a little?—What I had in mind when I wrote that was that it is not sufficient to tell the zamindar of the results you have obtained on an experimental farm; it is necessary to have demonstration farms where the conditions are very similar to those met with on the *zamindar's* own land. If he can see the results which have been obtained by utilising, say, a particular fertiliser or a particular improved implement on what is essentially a demonstration farm as distinct from an experimental farm, he will be much more inclined to adopt the methods shown him.

46,190. Had you in mind the possibility of increasing the number of short courses for the sons of zamindars?—I think zamindars' sons who are definitely going back to their land ought to be given facilities for something in the nature of vernacular instruction.

46,191. You say also that middle vernacular schools should be in closer contact with Government demonstration farms?—Yes.

46,192. How can those farms be of greater use to the schools than they are at present?—As I have said, I deprecate the schools having farms actually attached to them. They should have gardens, and the agricultural instruction given in them should be rather of the agricultural bias type; but the students should be given facilities to visit demonstration farms.

46,193. On page 750, referring to the improvement of water-logged soils, you say: "The improvement of waterlogged and *kallar* soils is now relegated to the province of engineering, and may be summed up by saying: 'Drain the waterlogged soil; open up, flood and drain the *kallar* soils'." What happens to the salt which is washed down in reclaiming *kallar* soils?—Unless you can drain the land adequately, the salt is not as a rule washed down to a sufficient depth entirely to get rid of it.

46,194. It comes up again?—Yes.

46,195. If you go on repeating the process, what will happen?—Assuming you cannot drain the land, the application of water and its capillary rise to the surface will go on in a continuous cycle.

46,196. The final result may be that the land will become so salt as to be valueless?—That is quite possible.

46,197. Is the percentage of soda in your Punjab soils generally high? Have you looked into that question?—It is fairly high in *kallar* soils, but in normal soil it is not particularly high.

46,198. In what form is the soda usually present in the soil?—Chlorides, sulphates and carbonates.

46,199. Is there much sodium silicate in the Punjab soils?—In the form of sodium silicate itself?

46,200. I was thinking of double silicates?—Not an excessive quantity. I have not applied myself to the study of the silicates in soils.

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46,201. Has the alluvium mainly resulted from orthoclase felspars, or have you soda felspars in the rocks from which your alluvium has been derived?—I have not studied the subject.

46,202. You make a strong plea for the feeding of more oil-cakes in India, but the difficulty in India seems to be not the supply of feeding materials but the lack of money with which to purchase them?—Undoubtedly, but enhanced purchasing power would necessitate an increased supply.

46,203. Assuming anything were done to discourage the exportation of oilseeds, would not that react on the price of them and reduce the money in the hands of the growers of such crops as groundnuts?—You would certainly have an economic cycle which would have to be investigated to find out whether the diminution of export would tend to reduce the area of land under such seeds. Provided you could get sufficient demand for the products in India, I see no reason why the area should be reduced.

46,204. But seeing the demand does not suffice for the existing products used as cattle foods (several other cattle foods are relatively cheaper here than oil cakes) what prospect is there of a sufficient amount of the oil cakes not exported being consumed within the country?—That depends on whether the vast numbers of cattle in the Province could be better fed. They are underfed to a large extent at present.

46,205. You say that only by continual and strenuous development of education and propaganda can we bring about the better feeding of animals. Should you not add: "and by proving that feeding pays"?—Yes, that also requires to be demonstrated.

46,206. You advocate that fertilisers should be sold under standards laid down by the Central Government; do you think there is any considerable danger from the adulteration of fertilisers at the present time?—I am not in a position to say to what extent they are adulterated, but I think we ought to have definite standards according to which all fertilisers should be bought and sold.

46,207. We are dealing at present, in India, mainly with two fertilisers: nitrate of soda and sulphate of ammonia; and they are not subject to adulteration?—No.

46,208. They are usually pure?—Yes.

46,209. If you lay down a standard, you must also enforce control, and that means supplying staff. Would the staff required for control not be better engaged in educational work and propaganda in order to develop the use of such fertilisers?—Probably a better method would be to regulate the price of fertilisers sold according to the standards to which they conform.

46,210. With reference to page 751, in reply to the Chairman, you have alluded to the very rapid loss of nitrate that occurs in this district although the rainfall is low; if the nitrates are not washed out, how does one account for their disappearance? Do you suppose that they are reduced?—It appears to be due to some denitrifying activity of organisms in the soil.

46,211. And that may take place quite rapidly under the low rainfall conditions that you have in the Punjab?—It certainly does take place very rapidly under the conditions that we have here.

46,212. It has been assumed that a considerable amount of waterlogging and high rainfall are necessary before such denitrification can take place?—I am not prepared to say to what extent a high rainfall would accelerate or retard that denitrification.

46,213. You say that mineral oils are imported into India for the purposes of food adulteration; surely this business is not carried on to any large extent?—Yes.

46,214. Mineral oils are absolutely valueless as food?—Yes.

46,215. Adulteration by a mineral oil is a much worse thing from the consumer's point of view than substitution of some vegetable oil?—Much.

46,216. Did you get evidence of such adulteration in your enquiry?—I got evidence of that, and I have given an illustration in which coconut oil, having been imported from Cochin and Madras, was sold in Calcutta at a lower rate than its market value in Cochin itself, owing to the adulteration with a cheaper mineral oil.

46,217. Would there be any chemical difficulty in detecting such adulteration?—None whatever.

46,218. So that it does look as if this particular trade requires regulation and control?—That is what I had more particularly in mind: the adulteration of a vegetable by a mineral oil.

46,219. With reference to the question which was raised by Sir James MacKenna, see page 755 of your precis. This Indian oil mill manager argued for the free importation of raw material into India. Did you find out what he was thinking of? Did he want to get palm kernels imported?—This was the predecessor of the present manager, so that I did not actually see him. This remark was quoted from a note given me by the present manager.

46,220. Do you know whether these managers wished to import palm kernels for the manufacture of margarine?—I think they would be rather averse to any such importation; there is any amount of copra from which oil may be extracted.

46,221. *The Chairman*: Would you find out what he did mean and let us know?—I will.

46,222. *Sir Thomas Middleton*: It would appear from the statement that there might be some oil seed of special value in the preparation of margarine which they are not able to use because of the import duty. On page 755, referring to general education, you say: "Generally speaking, I consider that rural education must follow and not precede a general amelioration of the lot of the agriculturist." Most educationists have reversed the order and have said that until you get better general education you will not have general amelioration taking place. I should like to get your views on that?—What I had in mind was that you must get amelioration of the lot of the agriculturist, generally speaking, otherwise the effect of his education will be to take him away from the land. I am speaking purely with regard to education and its effects on the likelihood of the recipients returning to the land.

46,223. You are pursuing the argument that is set out in the previous paragraph?—Yes.

46,224. That argument, as I read it, is this, that in the interests of agriculture the educational policy should concentrate more on vernacular education?—Quite so.

46,225. Both literary and technical?—Yes.

46,226. A larger percentage of the funds available should be devoted to this type of education; that is what you have been arguing?—Yes, rather than to a type of education, which tends to withdrawal from the land.

46,227. There is some evidence that the powers of digestion of Indian cattle are greater than those of European and American breeds; have you got evidence of that?—I have not sufficient definite evidence to support that at present.

46,228. Have you any definite evidence which would warrant you in concluding that the maintenance requirements of Indian cattle may be substantially less than those of European and American breeds?—From the figures which I have got at present there appears to be an indication of a

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somewhat lower figure, though certain figures which I have obtained are definitely up to the figures given by American workers. For example, I have recently investigated a maintenance ration for hay, and the figure obtained is practically identical with a corresponding figure obtained by Armsby in America. But I have not sufficient data yet to draw any definite conclusions.

46,229. *Sir Ganga Ram*: Have you ever visited Cawnpore?—I have.

46,230. Have you seen Doctor Fowler's laboratory?—Doctor Fowler was not working there at the time of my visit.

46,231. In his evidence before us, he said that in 24 hours you could convert all the rank grass that is growing on the canal banks into organic manure?—By bacterial action?

46,232. I do not know what action he meant; but are you aware of that?—I was not aware that you could get it converted so rapidly.

46,233. Have you had any investigations of that kind?—We have not had any yet.

46,234. Have you any investigations at all on fertilisers?—We have no investigations at all going on at present on fertilisers as far as I can tell you. I am referring to investigations on fertilisers of the type which you have just mentioned; I am not referring to general investigations on fertilisers.

46,235. What is the name of the tree which is grown in Australia and America which they consider absorbs chloride of sodium from the soil?—I know perfectly well to what you are referring, but I cannot give you the name at the moment.

46,236. Have you thought of making any investigations on *lana* which is grown in the Jhelum district?—I have noticed that *lana* grows very prolifically on alkali soils.

46,237. Does it have a good effect on the soil?—I cannot give you data to support that. It lives on the *kallar* soil and it takes a considerable amount of salt from it; one might therefore conclude that prolonged growth of that plant would have a beneficial effect on the soil.

46,238. And it is food for camels?—The camel does eat it.

46,239. *Sir Henry Lawrence*: What is the other name for the *lana*?—I cannot tell you the botanical name.

46,240. *Sir Ganga Ram*: Do you think the digestion of animals is affected by want of salt?—Undoubtedly; if an animal is deprived of salt it will affect not only its digestion but its whole condition.

46,241. In other countries salt is considered necessary for the cattle, is it not?—Absolutely necessary.

(The witness withdrew.)

SARDAR SAMPURAN SINGH, Barrister-at-Law, Honorary Secretary, Lyallpur Central Co-operative Bank, Ltd., Lyallpur.

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION.—(i) No.

(ii) Yes, all over the Province.

(iii) Yes, provided a sufficient number of good teachers can be had from the agricultural classes.

(iv) Yes.

(v) The main incentives* which induce lads to study agriculture are:—

1. A career as an agriculturist.
2. The idea of service.

* See also replies to Questions 46,280-21.

(vi) Yes.

(x) By making agriculture pay more, either by introducing more paying crops, or by increasing the yield of old crops by better farming.

(xii) Adult education in rural tracts can be popularised by:—

1. Opening night schools.
2. Propaganda.

QUESTION 4.—ADMINISTRATION.—(*c*) (i), (ii), (iii), (iv), (v), (vi). They have done great service to agriculture, but still they require great improvement and extension. It may be suggested, that if canal banks are metalled, and opened to the public traffic, we can have a large number of useful roads at very little expense. One has to remember that a great deal of money is spent on the canal banks, as they are at present. In the same way, canal telegraphs can be opened to the public. There should be a veterinary hospital for every group of four or five villages, and a post office in every village. In villages where post offices do not pay their way, co-operative societies should be allowed to make up the deficiency, and, on their giving security for such deficit, the Postal Department should make no objection in giving post offices to such villages.

QUESTION 5.—FINANCE.—(*a*) We should try to open as many co-operative credit societies as we can, and strong central co-operative Banks in every *tehsil*; of course we can have co-operative mortgage banks for long term loans.

(*b*) The Government system of *taccavi* will not be popular, unless the disbursement of this fund is taken out of the hands of executive officers. It will certainly be taken full advantage of if the work of its distribution is entrusted to the Co-operative Department. The corruption of the petty civil officials is more or less responsible for the people not making full use of *taccavi*.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*b*) The Usurious Loans Act is a dead letter; it exists only on the Statute Book; it must be enforced.

(*c*) Cultivators should not be allowed to mortgage or sell their lands when their holdings become less than eight acres of well irrigated land, 12 acres in the case of canal irrigated land, and 25 acres in the case of *barani* land.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) There should be some legislation that a holding should not be sub-divided, after it has already been reduced to eight acres in the case of well-irrigated, 12 acres in the case of canal-irrigated, and 25 acres in the case of *barani* lands.

(*b*) The chief obstacles in the way of consolidation of small holdings are:—

1. Local jealousies of the people.
2. Sentimental attachment to the old paternal holdings.
3. Different qualities of land in the same village.
4. Absence of the spirit of co-operation amongst the people.

These obstacles can be removed by propaganda work, as it is being carried on at present in the central districts of the Punjab; but it is a slow process, and I think that the introduction of some legislation to compel the people to consolidate their holdings will be very useful.

(*c*) As already suggested in answer to parts (*a*) and (*b*) of this question, I consider that legislation is necessary to deal with such cases. It may here as well be pointed out that some legislation may be introduced to allow widows to retain some portion of their late husbands' property till their death, even if they marry again; this will remove a great obstacle in the way of their second marriage, and moreover will save the late husbands' relatives from much litigation. Besides, this will remove so much immorality from the villages.

Sardar Sampuran Singh.

QUESTION 8.—IRRIGATION.—(i), (iii). Irrigation by canals and wells should be made complementary to each other. In districts where subsoil water is deteriorating the soil, the supply of canal water should be stopped. The tube well system should be started either by co-operation or Government patronage, and it should be so arranged that the zamindars should get water at the same rate as in the districts irrigated by canals.

(*b*) No. I am not satisfied with the present system of the distribution of canal water. This encourages corruption amongst the officials.

If the volumetric system is introduced it will be a great improvement. The duties of the Canal and Revenue Departments to a great extent overlap; the machinery should be simplified and the revenue work should be given into the hands of one department.

QUESTION 15.—VETERINARY.—(*a*) The Civil Veterinary Department should not be under the Director of Agriculture. It requires a lot of extension, and under the present circumstances it is reduced to a secondary position, and does not receive the attention it deserves.

(*b*) (i) Yes.

(ii) No.

(iii) No

(*c*) (i) No. They can be more popular if the Veterinary Assistants are always taken from amongst the agricultural classes. Admission to the Veterinary College at Lahore is gained by recommendations or through influence. The poor zamindar finds the door shut for him unless he happens to have some influential friend. There should be a rule that no non-agriculturist should be taken into this service. The number of dispensaries should be increased; each group of four or five villages should have a hospital.

(ii) No. As a matter of fact, they cannot be very useful. The system of touring dispensaries should be stopped.

(*d*) The chief obstacle met with, in dealing with the contagious diseases, is the insufficiency of staff. I do advocate legislation to deal with notification, segregation, &c.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*d*) Yes.

QUESTION 18.—AGRICULTURAL LABOUR.—(*a*) (i) In such areas, labour can be attracted by propaganda, and by providing them with facilities to travel at cheaper rates. Naturally, at such places wages will be higher than at the places where labour is in abundance.

(ii) So far as my knowledge goes, I cannot think of any healthy place to which a Punjabi peasant would not run if he finds land to cultivate. So it requires only a little organisation to take agricultural labourers to such uncultivated lands, merely for the asking. I deal only with the permanent migration of the agricultural population.

QUESTION 20.—MARKETING.—(*c*) Co-operative commission shops should be opened and their position should be made strong by providing facilities to enable them to deal directly with the buyers in Europe. The middleman adulterates the agricultural products causing deterioration in their quality, and thus bringing the Indian qualities down in the estimation of foreign buyers. In the same way, co-operative ginning factories should be opened and Indian-American cotton should go out of the country without any adulteration. For such adulteration I blame the ginners, and the import and export firms who sometimes encourage the same.

(*d*) Yes.

QUESTION 22.—CO-OPERATION.—(*a*) (i) The Government should increase its staff, to do more propaganda work and to guide the village communities.

(ii) They should employ men of higher education, who should, through books and experience, be in touch with the co-operative systems of the various countries of Europe.

(*b*) (i) Their network should be extended as much as possible.

(ii) They have not been, so far, very successful in the Punjab, the reason being that they were started just about the end of the great War, and ever since prices have been falling. This brought a certain amount of demoralisation amongst the workers. There is no reason why they should not succeed, if properly organised. As a matter of fact, they can do more good to the zamindars than any other kind of societies, in the way of importing bullocks, seed, agricultural implements, and household necessities.

(iii) Societies in the form of co-operative commission shops are constituted for the sale of produce in practically all the markets of Lyallpur district, and they are being opened in other districts of the Province as well. They are fairly successful but they cannot be really useful unless business connections are established direct with the different business centres in Europe. These shops have to work according to the local customs and the usages of the respective markets in which they are conducted. In a sense, they cannot altogether be independent of urban people, who more or less control these markets, and establish such usages, which are favourable to them, and prejudicial to the rural classes.

(v) So far, no society of this kind has been organised in this part of the country but indeed they will be of very great use and benefit. This complements my views expressed in answer to Question 7.

(vi) These societies are so far absent in these districts, except that sugar-pressing machines are bought and worked on co-operative lines, though these societies are not properly organised or registered. It would do a great good if the same system were extended to agriculture in the case of tractors, water lifting (in the case of lands not commanded by flow irrigation), and even to cotton ginning, and sugar manufacturing.

(vii) This kind of society is almost a necessity where land has been fragmented into small holdings. There being no law of primogeniture in this country, the lands are divided and sub-divided into small holdings of, sometimes, a fraction of an acre. If a zamindar with twelve acres of land has four sons, then each of them realises that he is going to get his three acres after the death of his father and he shillyshallies for the greater portion of his life, that is, till the death of his father, and after that he tries to cultivate those three acres, out of which he cannot make his living. If the law of primogeniture obtained in this country, then, except the eldest, all the other sons would try to stand on their own legs, and carve out their own careers in some other sphere of life. This means so much wastage of the energy and time of the people. The introduction of joint-farming societies would bring so much economy both in supervision and labour that a large number of young men would be set free to do other productive work.

(viii) This branch of agriculture requires special attention. So far, very little has been done to improve the breeds of cattle in this Province. We have to begin by selection and cross breeding. No doubt cattle breeding societies will be of great use, but in the beginning we should have large cattle breeding farms, working under Government experts, and we should propagate the results we get there. Dhani bullocks are very good, but the cows do not give sufficient milk. Montgomery cows give plenty of milk, but the bullocks from that tract do not make good draught animals. Both cows and bullocks from Hissar are good but they require more feeding, and the Hissar bullock especially will not keep in good condition unless fed on grain. More or less, cattle breeding is a question for experts in the beginning, before it can be handed over to cattle breeding societies in general.

(*c*) I am of opinion that legislation should be introduced to compel unwilling minorities to join for the common benefit of all, so far as schemes for the consolidation of holdings are concerned.

(*d*) The societies of which I have personal knowledge have achieved their object, in the sense that they have done some good, but not in the sense that they have done all that they ought to. There still is, and always will be, a great scope for progress.

Sardar Sampuran Singh.

QUESTION 23.—GENERAL EDUCATION.—(*b*) (i) Rural education may improve ability and culture of agriculturists, while retaining their interest in land, if the schools are taken to their homes, and they are allowed to p in touch with agricultural life, while at the same time acquiring cation during their spare hours. Absence from their homes, boarding se life, and association with the rich classes of the towns, sever the 's connections with rural problems and make him a town-man in practice life, if not in sentiments.

ii) I have no experience of compulsory education but I can say that h education as I have indicated above, even if compulsory, would do a at good.

QUESTION 24.—ATTRACTING CAPITAL.—(*a*) Personally I am of opinion that arge number of men of capital and enterprise have taken to agriculture, so far their policy has been in the direction of expansion of their dings, and not of effective agriculture.

b) Owners of large areas of agricultural lands, when they get rich, go live in towns, enter into some other profession, and lose touch with real iculture; and naturally become less keen to carry on improvements in ir lands. The time has come when big landholders are beginning to e interest in their holdings, and I hope the time is not very far when h zamindars will be pioneers in the coming improvement in the agriture of India

QUESTION 25.—WELFARE OF RURAL POPULATION.—I think some legislation uld be introduced to compel the rural population to keep farmyard nure at a sufficient distance from their homes and the village sites. ecial care will have to be taken to save them from avaricious petty cials through whom such laws will have to be exercised.

Oral Evidence.

6,242. *The Chairman*: Sardar Sampuran Singh, you are a barrister-at- and honorary secretary of the Lyallpur Central Co-operative Bank, Ltd., allpur?—Yes.

6,243. I see, in answer to our Question 2, on page 796, you suggest that ult education in rural tracts can be popularised by opening night schools d by propaganda. Have you had any experience of night schools for ults?—We did start some adult night schools here.

6,244. Were they a success?—They are just beginning; I hope they will a success.

6,245. Do you know that the Education Department has in many cases en over that work from the co-operative societies?—No, I do not know t.

6,246. Do you make sure that there is a demand for adult education ore you commence the classes?—There is a great demand.

6,247. How many persons are attending this particular school?—I have gathered the statistics.

6,248. You do not know?—No.

6,249. On page 796 of your note, in answer to our Question 5, you say t the Government system of *taccavi* will not be popular until the dis-sement of this fund is taken out of the hands of executive officers. your suggestion that the Co-operative Department should administer whole of the *taccavi* loans?—Yes.

6,250. How do you suggest the Co-operative Department could make *cavi* loans available to non-members?—It would be done through the pectors, because they are more popular officers than the executive officers,

the *Tahsildars* and others. The Co-operative Department is more in touch with the public.

46,251. But your idea is that non-members could be served through the co-operative organisation?—Yes.

46,252. Why do you think executive officers are unpopular in this matter?—There is more officialdom among them; they do not mix with the people; they have to carry on their executive work, and it costs so much for people to come to the headquarters of the district or the *tahsil* to get money; there is so much red tapeism about it: the papers have to go through the *patwaris* and so on, and all that work means so much wastage time as well as expense of money—moreover there is so much corruption in the lower ranges of the civil department.

46,253. On page 796, in answer to our Question 6 on agricultural indebtedness, you say that the Usurious Loans Act is a dead letter; it exists only on the Statute book and it must be enforced. Do you suggest that there must be some amendment of the existing Act, or how do you propose to enforce it?—The judicial officials should be instructed to make more use of that Act than they do at present.

46,254. Have you yourself studied the Act?—Yes, I have seen it.

46,255. In answer to our Question 15, on page 797 of your note, you say that the number of dispensaries should be increased and that each group of four or five villages should have a veterinary hospital. Have you studied the financial provisions required for the carrying out of that suggestion?—No, I have not studied the financial aspect of it.

46,256. It might be very important, might it not, because it might cost a great deal of money?—It will.

46,257. You think it would be worth while?—In the beginning, we need not have a hospital for every four or five villages.

46,258. That is the ideal to which you would work?—Yes.

46,259. On page 797, in answer to our Question 20 (c), you suggest that co-operative commission shops should be opened and that they should be put in touch with buyers in Europe?—Yes, by unions; we should have a union of co-operative commission shops of three or four districts, and in that way we should have five or six unions in the whole Province which could directly deal with buyers in other countries.

46,260. Who would finance the movement of the wheat and the shipping?—That depends upon the arrangements which are eventually made with firms in other countries, or some arrangement could be made with the European firms which have already got their offices in India.

46,261. Have you thought out that problem in detail?—No. We could begin, of course, by selling those things to the European firms in India direct, instead of having another middleman between that firm and the producer.

46,262. In answer to Question 22, on page 9, you say they should have men of higher education who should, through books and experience, be in touch with the co-operative systems of the various countries of Europe. Are you not satisfied with the existing service?—I think it could be improved.

By more knowledge?—Yes, better education, more imagination.

46,263. Do you think that the co-operative movement is likely to venture into the field of retail selling societies in the near future?—For the members, yes.

46,264. Would you suggest that credit societies should undertake that work?—No, there should be separate societies.

Sardar Sampuran Singh.

You are not in favour of multiple purpose societies?—No.

Sir James MacKenna: What is the capital of the Lyallpur Central ——— About 22 lakhs.

46,267. How much have you in deposits from non-members?—About seven lakhs.

46,268. Is that all drawn from residents in the Lyallpur area?—Mostly.

46,269. From what class of people do you get most of your deposits? From Government officials and prominent business men in the town?—No, not mainly from business men in the town; more from zamindars.

46,270. Mainly from rural people?—Yes. Lately we have been getting deposits from people in the town as well, but not to a considerable extent.

46,271. Do Government officials deposit their money with you to any great extent?—They do.

46,272. What rate of interest do you give?—We have lately increased our rate of interest owing to some other Central Banks having done so, and we are now giving Rs.6.4.0 per cent. for six months.

46,273. That is very good interest. Do you feel that the co-operative movement is increasing the idea of trusting money with banks?—Yes.

46,274. On page 796, you bring the somewhat general charge against the Irrigation Department that they do not allow traffic to go along the roads on the banks of canals, which are amongst the best roads in the country?—They do not, because the roads are not metalled, and if they allowed general traffic to use them, they could not keep them in good condition. I propose that they should first be metalled.

46,275. At present that prohibition is maintained on account of the danger to the canal which would otherwise be involved?—Yes.

46,276. *Professor Gangulee*: Is the number of agriculturist moneylenders increasing in this Province?—No.

46,277. With regard to your commission shop, are you at present dealing with any exporters direct?—Sometimes. When we want to have any transactions with them we do, but there is no permanent connection.

46,278. Where do you sell your goods? In the open market here?—Yes.

46,279. In your legal career have you had occasion to utilise the Usurious Loans Act?—Not once, because the Judges—mostly belonging to non-agricultural classes—do not favour this Act.

46,280. In answer to our Question 2, you say that the main incentives which induce lads to study agriculture are, first, the career as an agriculturist and, secondly, the idea of Government service?—Yes.

46,281. We are always told the idea of Government service predominates?—That is true.

46,282. You put the idea of Government service second; it should be first?—Yes.

46,283. *Mr. Calvert*: You are a Sikh, belonging to a cultivating family?—Yes.

46,284. And you are a honorary worker for co-operation?—Yes.

46,285. Do you find yourself much interfered with by official control?—No. I am helped by it.

46,286. How many joint stock banks are there in Lyallpur now?—Seven or eight.

46,287. In spite of the presence of those seven or eight banks, you have no difficulty in getting deposits for your Central Bank?—No.

46,288. Have you been able to see the better-farming societies in the Lyallpur district?—No.

46,289. We were told yesterday that these co-operative societies were no good. Are such complaints sometimes due to personal reasons?—There cannot be two opinions about the co-operative movement having done good to the country, so if anyone says it has not done good that must be due to personal reasons.

46,294. *Mr. Kamat*: In this Province, I am told that as a rule a man is allowed to do agriculture only if his father and grandfather did it?—There is no such rule.

46,291. Then what are these agricultural tribes?—I am myself classed as an agriculturist, and my experience tells me that of the statutory non-agriculturists in this Province who hold land, 99 per cent. do not cultivate their land or take any real interest in it. When we use the word "agriculturist" we mean a family or tribe which works on the land with their own hands.

46,292. You say only a man whose father and grandfather did agriculture is capable of doing it?—That is not so but others would not take to the tilling of land; if they did, we would certainly class them as agriculturists.

46,293. You are a barrister-at-law yourself?—Yes.

46,294. Yet you are devoting yourself to agriculture?—I do not think I am doing agricultural work.

46,295. Though you belong to the legal profession, are you not helping co-operation?—Yes.

46,296. So, legal gentlemen help these movements and are of some assistance to agriculture?—True, but non-agriculturists do not take much interest in the movement or in any movement which has anything to do with agriculturists.

46,297. You mean they take an interest only in co-operation?—They do not take much interest in co-operation. I am a lawyer myself, but I take an interest in it because I come from a family who are engaged in agriculture.

46,298. And not in your capacity as a lawyer?—No.

46,299. *Mr. Roberts*: In the demonstration work of the Agricultural Department, would a member of an agricultural tribe have a better chance of succeeding than a non-agriculturist?—Yes.

(The witness withdrew.)

The Commission then adjourned till Saturday, 12th March, 1927, at 10 a.m.

Saturday, March 12th, 1927.

LYALLPUR.

PRESENT:

The MARQUESS OF LINLITHGOW, D.L. (*Chairman.*)

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.
Sir THOMAS MIDDLETON, K.B.E., C.B.
Rai Bahadur Sir GANGA RAM, Kt., C.I.E., M.V.O.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.
Mr. H. CALVERT, C.I.E., I.C.S.
Professor N. GANGULEE.
Mr. B. S. KAMAT.

Mr. C. A. BARRON, C.S.I., C.I.E., C.V.O., I.C.S.
Mr. W. ROBERTS, B.Sc. } (*Co-opted Members.*)

Mr. J. A. MADAN, I.C.S.
Mr. F. W. H. SMITH } (*Joint Secretaries.*)

Mr. W. R. WILSON, I.C.S., Deputy Commissioner, Jhelum.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(*a*) (i) "All research." It is not everyone who can go to Pusa or Lyallpur, and few cultivators even know of the publications and work of those places. The more intelligent cultivators in Dera or Jhelum may have heard of a Pusa wheat, or a Lyallpur cotton, but that is about all. It is suggested that there is room for a little homely research as well, going hand in hand with demonstration. The Punjab Government is now establishing demonstration farms at the headquarters of districts, and also in *tehsils*. These farms might also be used as experimental stations, widening the facilities for homely research, i.e., not only enquiring into the scientific value or haphazard growth of the local indigenous system of agriculture but carrying out, for example, a local soil survey, and endeavouring to discover the distinct qualifications locally of soils which, chemically analysed, are similar to soils which elsewhere behave in a different way. Given an enterprising and efficient staff in charge of the demonstration farm or experimental station, the farm could not only boom its own wares to a conservative audience as farmers are, but the farm could enlist the support of interested and intelligent cultivators in various localities for concurrent experiments on the same lines on the cultivator's own *modus agri non ita magnus*, or for independent experiments by individual farmers. The co-operation of the countryside will be more quickly attained that way than if the demonstration farm simply blows its own trumpet. One danger is that superior soil may be selected for the farm area. If the proposed farms then become not only demonstration plots but experimental stations, the staff and countryside will jointly benefit, and that will form the very kernel of agricultural education.

I would also suggest the formation of an association of voluntary workers, e.g., "the Chakwal Association for the Improvement of Agriculture," the membership of which should depend on something attempted, something done, on the home farm in consultation with the station's work—membership to be a badge of honour.

(*a*) (ii) and (*b*).—*Veterinary Research.*—May I make brief mention of an institution in the Jhelum district known as the Sohawa Laboratory on the Grank Trunk Road, which lost the valuable services of Major Crosse, F.R.C.V.S., Camel Specialist, four years ago? *Surra* is a deadly disease, a

kind of sleeping sickness that attacks camels, ponies, and, in a less degree, bovines at the end of the rains. Major Crosse discovered a cure in some preparation of tartar emetic, which has been improved as these things get improved since his day. The laboratory is doing valuable curative work, with its branches in Montgomery and Karnal which are visited by Major Crosse's Assistant. A lot of interesting experiments are being carried out with artificially infected ticks (which seems a side issue if a layman may say so). But is any serious research being done to discover how the infection is transmitted *in nature*? The trypanosome would seem to deserve the attention of another Major Crosse.

(*c*) Experimental stations such as sketched in 1 (*a*) might begin observations with a view to establishing a local "Bureau of Soils" or "Bureau of Soils and Climates."

QUESTION 2.—AGRICULTURAL EDUCATION. NOTE.—I take agricultural education to mean the teaching of agriculture and not the education of agriculturists, though (xii) and (xiii) seem to refer to the education of agriculturists. In the two districts, with reference to which I understand a note of my experience is wanted, i.e., Dera and Jhelum, agricultural education can safely be said to have been nil. In Dera a few acres were acquired to start a school farm; lack of water and lack of interest prevented it being started in my time. One or two teachers went to Lyallpur for elementary training. I am unaware whether they ever gave anything like class room teaching in the schools to which they were posted. In Jhelum there is one trained teacher, posted to a school in the plains of the Pind Dadan Khan *tehsil*, which has three acres of land attached to it. But the land is tilled and watered by hired labour, and the boys only play at their allotments, which are not visible to the uninstructed eye. There is a proposal to start another school farm, but it cannot be done on the meagre sum allotted by the Education Department for the purpose.

With these preliminary remarks:—

(i) No (I do not refer to agricultural colleges).

(ii) Yes—if rural boys who go to school are to be given any instruction in agriculture.

(iii) Yes—as far as possible.

(iv) Lyallpur, I believe, attracts good attendances; the solitary one-acre and one-teacher middle school in Jhelum is little more than a toy.

(v) Most of the boys who go to Lyallpur hope to get Government employ in the end.

(vi) Yes; I suppose so.

(vii) Please see answer to Question 23, General Education (*a*) and (*b*).

(viii) (*a*) Nature study should be as welcome as elementary hygiene to relieve the crushing monotony of the class rooms, and worth affiliating to the boy scout movement. I understand instruction is now being given in the Punjab in nature study to teachers, but I have never heard of any boys going on excursions in the Jhelum district.

(*b*) Playthings compared with the fields at home. I am sure the parent despises them, and probably the boys do the same.

(*c*) The difficulty is to get the school farm; it is neither easy nor cheap. If properly equipped and managed and linked to class room teaching with a competent instructor, it should have a future, but I have yet to see such a school farm.

Continuing with (x). If a reference can be made to youths in the middle classes in country schools, it might be possible, particularly if there is any demonstration farm in the neighbourhood, to get country boys to work a

home on the soil belonging to their parents. The Punjab Government recently intimated a proposal "to start concentrated demonstration work in the interests of agriculture, public health, co-operation, cattle breeding, communications and medical relief" in selected areas. One of the areas is the Chakwal Zail (a congeries of villages) in the Jhelum District. A note is asked for showing "how you propose to give effect to the scheme" of concentrated demonstration work. The local education authority suggests opening another night school for adults and a branch school. It is proposed to set up a demonstration farm in this area in the near future, but it so happens that the locality possesses a practical agriculturist who has done a good deal himself in the way of demonstration and propaganda in market gardening, selected seed, improved instruments, conserving of manure and the like. It might be possible in this "intensive" area to get this educated agriculturist to lecture on Saturdays in one or more of the middle schools on his practical experience. If the Education Department could interview the parents, and get permission for their sons to cultivate a tiny patch at home, e.g., cauliflowers (the speciality of the lecturer in question), prizes could be given for the best exhibit or produce, and it would not cost the parent much to let his boy sell his produce through some co-operative commission shop. This might be a beginning for boys in learning practical agriculture and home economics. It might help to evoke an interest in the soil, and teach practical handiness to farmers' sons.

(xii) There are no signs of any Alfred Mansbridge yet. Night schools for adults in the country are usually frauds. The teaching is undertaken by day school teachers, who are only out for extra allowances. Co-operative societies' night schools are better and more genuine institutions. The Punjab has recently started imitating England in trying to set up Rural Community Councils. Co-operative night schools are a suitable field for Rural Council lantern lectures and the like—to be given by some enthusiastic teacher and his top boys from some communal or sectarian secondary school in the neighbourhood, for it is in these schools that you get a warmth and vitality at times not to be found in the duller Government schools.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) In Dera, demonstration work had hardly begun up to 1924. Some selected seeds had been distributed, and Punjab 8A wheat proved popular. Government has a big estate (Dhundi estate) managed by a *tahsildar*, but the cultivation on it is very slovenly. American cotton was found not well suited to Indus irrigation canals. Experiments made were all amateur experiments. Dry gram cultivation in recent years has achieved great popularity on sandy soils and light loam. Its successful cultivation was demonstrated by the farmers themselves, after someone had given them the idea.

In Jhelum, Meston ploughs are growing in popularity on the light loams, and ploughing matches have been started at the two cattle fairs. There is an Agricultural Assistant who endeavours to coach cultivators on his tours, but the best piece of work done in the district has been done in a simple though efficient fashion by the Chakwal (Hindu) zamindar, to whom a reference has been made in 2 (x)—Agricultural Education. This man has a farm of 200 acres, produces giant cauliflowers which he sells, making 25s. a day out of them in the season, which is a long one, has a yield of 20 maunds an acre from light *barani* soil (Punjab 8A wheat), conserves all his manure for his garden plots and elsewhere, uses Meston ploughs, the rigid harrow, &c., on his broad acres, and his neighbours are beginning to imitate him in seed selection and his methods. A little home leaven like this can leaven the whole lump.

(*b*) Please see answers to 2 (*a*) (i). Now-a-days Health Weeks have become familiar things, and a farmers conference—a meeting of the local

Farmers' Association for the nucleus—could be held with profit at the demonstration farm at some suitable season of the year. I have no such experience, but I feel strongly that the only way to make a farmer change his methods at all is to show him, under his own vine and fig tree, as it were, that you have a better system than the one he has got.

Poli (to return to local affairs) is a cursed thorny weed, which dirties fields very badly in many places in Jhelum. A *Poli* week is wanted in a suitable season. It is only by village co-operation that the harm done by this weed can be diminished.

(*c*) It all depends on the expert whether he be agricultural, veterinary or what not. An enthusiast will always win disciples. It may be a trite thing to say, but until a man can make his personality flow through his effort as a producer of services and find in that effort the capacity of enrichment, an expert will only be a tinkling cymbal if he escapes being that worse thing, a lover of *hakumat* and *dikhlawat* (power, position and parade), which are besetting sins in India.

QUESTION 4.—ADMINISTRATION.—(*c*) (i) The Agricultural Service is just beginning to make its weight felt in the more backward districts. I would only suggest that the Service should keep the head of the district informed about what is being done or attempted locally by means of some brief yet informative diary, as the Veterinary Service does. About the Veterinary Service, please see my answer to Question No. 15.

(ii) Railways—decidedly yes. Cheap fodder rates in times of scarcity are greatly appreciated. Could cheap freight rates be approved for transport of modern or up-to-date machinery?

(iii) Roads, from an agricultural standpoint, can only mean the service of the countryside in providing facilities for the purchase and marketing of commodities.

The Dera District is 230 miles long, with the North-West Frontier Province on the north and Sind on the south. A stretch of road from the new headquarters to a *tehsil* thirty miles south of headquarters is being metalled. The only other metalled road links up the new and old town (ten miles) and also runs up to the hills. Wheeled traffic (including motor traffic) can ply in the winter from fifty miles north of headquarters to the southern limit of the district, but in the summer when canals are running and hill torrent spates are abroad, communications are badly interrupted. I have had an involuntary bath in over two feet of running water on the main road as early as the beginning of May, and if the canal embankments breach, as they sometimes do, the eastern part of the district becomes a swamp. The canal banks and embankments form the summer highways. Camels are the main vehicle for the transport of field produce. The Board is very poor, the district is huge, but flat. Nearly all the expenditure is on the one main road running from north to south.

Jhelum is another poor Board, with a lot of natural difficulties to face in maintaining or improving communications—the Salt Range and broken country generally. The Grand Trunk Road (Imperial) is first class, but it only traverses one *tehsil*. Once off the Grand Trunk Road the roads are very bad, and a district like Jhelum, with the very broken Salt Range running right through it, deserves special help from Government. Unfortunately, the poorer the Board, the less it spends on its communications, and Jhelum is a great backslider. The real reason is that a competent engineering staff is not maintained. In neighbouring wealthy Shahpur, with a good and highly paid Engineer, great strides have been made of late. I give, with shame, some Jhelum figures. Setting aside a seven miles length of metalled road, which runs from Jhelum itself to a ferry for

Jammu, on which Government is allotting cent. per cent. for expenditure on development, a synopsis for the last two years is as follows:—

	Budget.	Revised.	Actuals.	Government Grant.	Year.
	Rs.	Rs.	Rs.	Rs.	
Metalled roads ...	15,000	13,850	973	4,701	1924–25
Unmetalled roads II & III.	25,000	39,825	12,262		
Total	40,000	53,673	13,235		
Metalled roads ...	2,000	1,000	706	4,120	1925–26
Unmetalled roads	41,000	17,500	17,260		
Total	43,000	18,500	17,966		

Percentage of net income spent on Roads: 1924-25 ... 4·9; 1925-26 ... 7·6

It is a very unsatisfactory state of affairs. With reference to maintenance and repairs, the contract system is expensive, and often fraudulent, and contract estimates get so criticised that the work is not given out. Gang labour is very casual, and complaints are always rife. To hand over supervision or execution of works to circle members leads to other difficulties. What the Board is now trying to do is:—

(i) restrict all contract work to the provision of bridges, causeways, culverts, &c.,

(ii) to get, if possible, gangs belonging to one family, so that road-making becomes the main industry of the household,

(iii) to draw up definite six monthly programmes—before and after the rains—based on some rough estimate of quantity and time, and allocate gangs on a prescribed time job,

(iv) to improve inspection and supervision. The money budgetted for expenditure on roads is too often either wasted or not spent, being reappropriated to some other head.

Fortunately, nature gives its compensations. The Jhelum hill camels would think nothing of going over the Alps.

(iv) Is of no practical service in present day district agricultural practice.

(v) Posts are an inestimable boon; they provide many amenities, not the least being the payment of military pensions. Jhelum has over 10,000 pensioners.

QUESTION 5.—FINANCE.—(*a*) The present day squire is more concerned with adding to his broad acres than with sinking money into the land he has got. One hears of enterprising capitalists in the Punjab, but they are either Hindus or Sikhs. For the small farmer the one big thing is co-operative credit. It can fertilise the small holding with gold and place a Midas hand on the land. The more short term credits that can be adopted the better; with long term credits, instalments should not be deferred or spread out over an excessive period; the memory of the improvement fades, and the thing becomes a burden.

(*b*) The Government system of *taccavi* in my opinion has been a failure. It is a generous thing, but it does not work well. Either the big people or the wrong people get *taccavi*. Too frequently the advances are not devoted to the objects for which the loan is made. Both the distributing agency and the collecting agency have been known to muddle or fake

accounts, and in most districts there is usually some confusion going on. The tahsil agency often find such trouble in collecting and disentangling accounts that decent tahsildars set their faces resolutely against giving *taccavi* at all.

There is, however, a lot of scope for the distribution of *taccavi* through the agency or even on the recommendation of co-operative societies, which breathe another air away from *sifarish* and officialdom.

If Government is to give *taccavi*, it should either be in kind, e.g., *bhusa* in famine years—with extra staff to see that the distribution is fairly made—or for some plain improvement, preferably against a definite contract, or for some engineering service beyond the means of a small man, e.g., sinking a tube well at, if possible, a concession rate. There could be no maladministration or embezzlement in this kind of service *taccavi*, to be repaid in not too many instalments. There is not a tube well in Jhelum, and only one in Dera, sunk by a Hindu capitalist. Incidentally both Dera and Jhelum have 90 per cent. of the population Mohammadan. The best farmers are the Hindus. The sinking of an ordinary percolation well is an admirable object for *taccavi*, but experience shows it is difficult to ensure that it will be sunk with the aid of the money advanced. It is a piece-work and piece-meal affair. By a definite contract I would instance the work of well borers. In Chakwal *tehsil* particularly, there is a lot of scope for boring wells. The wells with bores in them can be counted on one's fingers, but there are borers in Pindi and elsewhere who charge, I think, 4s. per foot, or 6s., or 7s. per foot if stone is met with. These people do the entire job themselves and enter into a contract, say costing 250s. to 300s. to put down a bore—an invaluable improvement, but the ordinary Mohamedan never has any money. Let the man show his contract and he should get his *taccavi* as a matter of course. No *taccavi* for well boring has yet been given to my knowledge.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(i) (*a*) Thriftlessness and extravagance particularly on marriages.

(*b*) Litigation, and all the Hosts of Midian in the shape of legal practitioners and their touts, including *patwaris*.

(*c*) A blight on the crops, a murrain on cattle, and failure of rains.

(*d*) *Pirs*, and the benevolences paid to them.

(*e*) The office of *lambardar* in non-canal tracts.

(*f*) Cattle lifting.

(*g*) Striving to give the children (often many) too expensive an education.

(ii) (*a*) *Banias* and *sowars*.

(*b*) In Jhelum small capitalist agriculturists like some retired Indian Officers who help to finance *Banias*.

(*c*) The sale of cattle.

(*d*) The sale or mortgaging of land, often in disguise (*benami*) to moneylenders.

(*e*) Pawning of ornaments.

(iii) (*a*) Despair at the Sisyphean task of rolling the stone of debt away.

(*b*) Improvidence.

(*c*) The knowledge that execution of decrees of civil courts can be beset with difficulties.

(*d*) The high rate of interest and dishonest account books.

(*e*) The social pressure that insists on the observance of traditional expenditure or extravagances, and last but not the least,

(*f*) Simple lack of means.

(*g*) The Punjab has already a useful summary Redemption of mortgages Act. The application of the Usurious Loans Act should be made more stringent: Civil Courts in the Punjab, which hear the bulk of the money suits, are largely staffed by kinsfolk and friends of the moneylenders and

shopkeeping classes. Land mortgage banks to be initiated with due care —in Jhelum.

A Bill for the protection of borrowers is under the consideration of the Punjab Government. Some such bill is wanted—a lot of swindling goes on in accounts which are purposely kept in a script nobody can read.

(*c*) The Punjab has already its Land Alienation Act, limiting the right of mortgage and sale, when an agriculturist proposes to transfer a right to a non-agriculturist. This Act, which has now been a quarter of a century on the Statute Book, only just came in time to save the expropriation of the peasant from their ancestral lands by moneylenders. The Act has defects which it is needless to go into here, but the main defect has to be noticed. In the South Western Punjab, the peasants, or a lot of the smaller fry have only exchanged servitudes. The "gombeen" man has been told "Hands off the land," but, there is the Mahommedan squire or junker in many of whom the passing of the Land Alienation Act has bred a perfect passion for consolidating large estates buying up cheaply or simply appropriating Naboth's vineyards, and creating a vast landless proletariat. But as these "Junkers" help to form Government's body guard on the Council, this ever growing *latifundia* "which ruined Rome and the Provinces" is not likely to receive any check.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*a*) Sub-division is inevitable under Mahommedan Law. The only thing possible is to try and provide for consolidation, and preach its benefit by graphically displaying results attained in the Central Punjab.

(*b*) The success that has attended consolidation societies in the Central Punjab has been striking according to the reports. In Dera and Jhelum there are difficulties of a special kind to face. In Dera the huge embanked fields irrigated from hill torrents are themselves permanent units of cultivation. They cannot be split up, though their proprietary shares are very involved. The village proprietary body, with shares scattered over scores of *bands* constitutes a rough *modus operandi* and cultivates on that rule of practice. As the value of the *bands* varies greatly according to the access to the torrent and stability of supply, anything in the way of permanent exchange and consolidation is very difficult, particularly when people do not follow the written record but depend on some rough and ready cutting of the knot of sub-division.

In the canal area, water supplies are so capricious and varying year by year that it is difficult to appraise the value of shares or land for exchange. There is no such stable currency in land or water values. Exchange in the Sailab on the Indus is manifestly impossible.

In Jhelum, the hills and the broken up *Khuddar* country produce land of such varying value that cultivators look askance at any proposal to exchange in any thorough-going fashion. The evil of sub-division is there right enough, but a farmer wants a plain bargain which the nature of the countryside makes it difficult to offer. However, in the blander more spacious Chakwal plateau, only propaganda is needed to start consolidation, though a drawback will be the faction feeling that ruins any amenities in this district. These Dhanni people will not listen to rhyme or reason when factions are concerned, and factions are everywhere. A woman drinks the warm blood of her slain enemy to keep her vow, and her sister taunts her for having become unclean by drinking the blood of pigs. But here as elsewhere, beginning will be half the battle.

(*c*) No. We have legislation enough. A retention of custom may be froward but this kind of legislation *ad hoc* is inclined to be a turbulent innovation. Generally speaking what is needed is simplification and codification of existing laws.

QUESTION 8.—IRRIGATION.—(*a*) (i) *Hill Torrent Irrigation.* In Dera, there are the hill torrents, the biggest of which has a catchment area of 1,800 square miles in the Suleimans. These torrents are dammed and the flood water drawn into a veritable network of distributaries. The work on embankments, dams and groynes is done by the cultivators themselves year by year and after the spates, under the supervision of the *tahsildar*, a very rough and ready system with much depending on the *tahsildar's* interest. I append the end of paragraph 83 of the Dera Settlement Final Report:—

> "Particularly under a fixed assessment system the management of this important and intricate *rodkohi* system should be the first concern of the Revenue Assistant, and it is hoped that the officers of the Irrigation Department in the District will be given the liberty to give professional guidance when required in the way of levelling, the use of groynes, silt and scour control, fascine work, stone crates, &c."

The second biggest torrent is the Kaha (Jampur *tehsil*) with plenty of country to deploy in. Now that the Gurchani hills have been surveyed, it ought to be worth while exploring the possibilities of a huge storage tank in any suitable basin in the hills. Perennial irrigation if possible would make a gold mine out of the very fertile loam.

Indus Inundation Canals.—These canals have their own peculiar and interesting problems. Dera is a Cinderella of a district—not really Punjab and canal officers, I think, affect to despise these rough and ready canals. But their successful working means a lot for the district. Perhaps an official like P. Claxton, who is familiar with the moods and vagaries of the Indus, could draw up a small *vade mecum*, on the creation of foreshores, the use of groynes in the river, the use of creeks when the river subsides, formation of water pockets, &c. I only make the suggestion as the Indus, which destroyed 27 *lakhs* of protective works round old Dera Ghazi Khan town, is a moody river which has to be wooed, and after the orderly and neat perennial canals an officer going to Dera Ghazi Khan may well feel he has fallen into chaos and black night, and a pocket book on the temper of the river would make it easier to avoid quarrelling with it.

In Jhelum there is the Salt Range, and on one of the plateaux of these rugged hills a good stream issues from the Eye of God, as the Hindus call it, at a height of 3,300 feet. There are other perennial streams with a considerable discharge. All these streams escape down ravines, cross a naked salt zone about 1½ miles wide before they emerge upon the plains, and getting heavily saturated with salt have ruined and go on ruining the plains between the hills and river in Pind Dadan Khan *tehsil*. This water should be golden: it is poisonous at present. Cannot an Engineer be put on two months' duty to explore the possibilities of flumes or high level channels on the main perennial streams?

(iii) *Wells.*—No well in this district (Jhelum) has any bore and there is no tube well. With hills in the district and the Himalayas on the east, one could possibly get even artesian supplies in the plains. The Minister for Agriculture is, I believe, creating a well or lift department.

(*b*) In the indigenous hill torrent administration in Dera there is a system called "*saropa paina*" under which the people at the head take all they can get and only let the surplus go to the tail. The Dera inundation canals used to work in some kind of sympathy with that rule. I remember seeing an abrupt order issue reducing the outlets on one of the canals from 250 to 100 at short notice. Many of the outlets are *katcha*. You get permission, take a mattock and dig a hole in the bank. But simple masonry outlets and pipes are being introduced. There are, of course, no meters or modules.

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QUESTION 9.—SOILS.—Marked deterioration is going on in the Pind Dadan Khan Thal owing to the constant infiltration of the salt perennial streams referred to in the answer to Question 8 (*a*). For example, two years ago, the town of Pind Dadan Khan (which used to have a population of over 20,000 and is now just under 10,000), had no complaint to make of its drinking water supply, which is pumped from a well on the river bank. Nowadays the water is absolutely non-potable—owing to the progressive deterioration going on (surface and sub-soil) from the infiltration of salt from the hills (four miles away). This taint in the drinking supply of the town has only appeared in the last two or three years. The Sanitary Board has recently recommended taking a pipe line from one of the streams in the hills at a cost of 2½ lakhs.

I have no experience at all of water-logging or *kallar* reclamation. It is a common belief in Dera that saturation of *kallar* soil by canal water, and growing rice will diminish *kallar*.

QUESTION 10.—FERTILISERS.—(*a*) Natural manures are wasted. A little plot round the village known as *niain* (Central Punjab) or *nail* (Jhelum) habitually gets manure, but too much of cattle manure goes into cow dung cakes. The manure dumped in exposed heaps round the village loses much of its strength and constituents before it is used. The ordinary cultivator stands badly in need of advice on the use and suitability of natural manure for various crops and on the method of preservation and storage.

(*c*) Price new fertilisers low to begin with and demonstrate and lecture on their use with special reference to soil and cropping.

(*d*) I know of none.

(*e*) Not locally in districts.

(*f*) Demonstration and propaganda.

The import of cheap coal and extension of wheeled traffic communications as far as possible.

The planting of trees on roads—village or Board. In Jhelum, it is difficult to say whether camels and goats or demobilised soldiery are worse in slaughtering road trees. Boards might find it pay to give neighbouring cultivators the property in trees or some of the trees planted in return for protection.

QUESTION 11.—CROPS.—(*a*) (i) There is a great field for seed selection. Wheat in Dera is invariably extensively mixed. In the Mazari country, the prize seed is what they call *darya bakhsh* or the gift of the river. A grain boat going to Sukkur foundered. The Mazaris got the stuff and found it was good.

Even if by some "home work," as suggested in the answer to Question 2 (x), boys are encouraged to select the best ears in their fathers' fields to breed from, and a prize is given for the best seer of clean seed, it would be something.

(ii) Japanese *sarson* and long-eared Australian *bajra* are two new crops that Jhelum might profitably try.

(iii) Co-operative societies, the Agricultural Assistant, or a practical agriculturist like Buta Ram (Chakwal).

(iv) Pig in the riverain do damage in Dera, but urial (*ovis cyclocerus*) have little chance in Jhelum with so many Indian officers with guns in the district. Rats are a nuisance both in Jhelum and Dera. Experts of the Agricultural Department would be well advised to take up rats and mice seriously.

(*b*) Long-eared *bajra* has already been suggested.

(*c*) Mention should be made in passing of the great success that has attended dry gram cultivation in sandy soils and sandy loams in the S.-W. Punjab.

QUESTION 12.—CULTIVATION.—(i) Leaving aside broad acres and the use of the steam or motor tackle and speaking only of the small farmer, Dera's main requirement is an improvement in the draught cattle. Improved implements will be used quickly enough, if the cattle can stand the strain, and, blood and bone apart, the question of nourishment comes in. Both Dera and Jhelum have two magnificent breeds—Dajil and Dhanni, but while the plough bullocks are generally good in Jhelum, the Dera canals and riverain plough cattle are miserable. The reason is that where there is rice, fodder is always short. See Question 16.

(ii) No. Lyallpur has taught interculture. Where tenants cultivate under *batai* rents, what appear uneconomic admixtures in the cropping arise from considerations such as the strength and needs of the tenants, fodder requirements, the domestic hearth, &c. The customary rotations have been built up out of experience of soil and climate, and I do not think any such improvement is to be made.

QUESTION 13.—CROP PROTECTION, INTERNAL AND EXTERNAL.—*Pests*: *Parasitic.*—The work of the Lyallpur Entomologists and Botanists has been valuable (boll worm and other cotton parasites), and with the expansion of district field work the teaching of the college will become more and more accessible.

Locusts.—Mention might be made of the plague of locusts at present scouring the Northern Punjab. I wonder whether Lyallpur can say whether the South African fungus (there used to be cultures at Muktesar) is efficacious or not against peregrine acridids in this weather.

Rats and field mice.—Rats in Dera were a plague in the embanked hill torrent terrain, causing a lot of damage to the embankments round the field and making them give way when the water was let in. Field mice do similar damage, though on a smaller scale, in Jhelum. The Agricultural Department might begin a field rat and mice campaign. I have seen a very knowledgeable horticulturist trying to get rid of the rats in his garden by copying the methods of the Health Department in its campaign against the black rat.

Manures.—Scientific advice is needed in the proper use of manures, bones —to prevent infection.

Hedges.—In fairly humid localities, the provision of a useful type of hedge would be a boon. Lopping would give some firewood.

Poli.—One of the worst pests in Jhelum is the *poli* weed. Its eradication does not require any such technical advice as getting the cultivators to pick in their loin cloths in a *poli* week as already suggested under the guidance of a supervising expert.

QUESTION 14.—IMPLEMENTS.—(*a*) None. New implements, suitable to the locality, are being displayed at cattle fairs, and the demonstration farms will play their part. Existing ploughs show such a variety district by district that one has an instinctive feeling of *quieta non movere* in the matter of improving time honoured local implements.

(*b*) (i) Reduce prices by some kind of bounty.

(ii) Distribute through the agency of co-operative societies.

(iii) Issue some implements, when novel, free of cost to selected farmers.

(iv) Open a board factory, and help and subsidise local artisans to learn production and repairs—a training school for country blacksmiths.

QUESTION 15.—VETERINARY.—(*a*) The Civil Veterinary Department should be under the Director of Agriculture. The two departments are too much at cross purposes at times. An incidental advantage is that there will be one independent department the less.

The Deputy Commissioner is never, or very rarely, an expert on agricultural problems, but he has his interest always riveted to agriculture. He

should not be too rudely extruded from a sphere in which he has a legitimate interest. There is perhaps a tendency on the part of technical departments, as they expand, to cut themselves adrift from the regular district administration, a temptation besetting experts to look upon themselves as living in a realm of their own. The Veterinary Department is older than the Agricultural Department so far as district work goes. I quote from experience when I note that a Deputy Commissioner has counselled his Agricultural Assistant to go and make a kind of demonstration farm in a Court of Wards estate, but the Agricultural Assistant looks to his Deputy Director in another district for instruction. There is again, in Jhelum, a Dhanni Cattle Breeding scheme for the improvement of that stocky, sturdy plough cattle. Again the Deputy Commissioner suggested a year ago there was now scope for some better selection of the cows to be covered by the scores of Board and stipendiary bulls. You want some blood and bone in the dam, whether pure, or half bred, before any proper herd book can be kept. The suggestion, apparently, gave offence, as it was the Veterinary Department that kept a record of the coverings, and the stud and subsidiary bulls, it was held, had to be popularised first of all. The Veterinary Department is quite right in saying that the sire is more than half the battle: of course it is; but the dam counts too, and some honour would be done to these mis-prized mal-nurtured cows by refusing the services of your prize bulls except to decent dams. I have to admit that later the department took stock of the cows and induced the Board to award prizes for the admission of cows into a herd book.

(*b*) (i) Yes. The system just passes muster. If the District Board control is light, I doubt whether provincial control would be any more effective. Everything depends on the character and worth of the man who is Veterinary Assistant, and he is under the control of his department.

(ii) Yes. The Punjab Government is pushing the extension of dispensaries.

(iii) On the whole, no.

(*c*) (i) No. Treatment is free, except for certain income tax assessees. To popularise the dispensaries, free use should be made of indigenous drugs. There are a lot of them. Let the Veterinary Assistant enter into friendly competition with the village "wise man," and villagers would quickly see who did better by them.

(ii) No. Veterinary Assistants are supposed to tour for a certain period in the month but they are like Assistant Surgeons, waste too much time at their headquarters.

(*d*) There are many difficulties. The fatalism of Mohammedans is one of them. I would not advocate legislation. The time only becomes ripe for legislation, if ever, when demonstration and propaganda have done their work, when boys in schools have learnt elementary lessons about infection, and when the village *mullah* has become converted. I remember in Dera meeting a big herd of cattle going to a cattle shrine—cattle have their spiritual comforters just as human beings have—to be blessed. There was a lot of rinderpest about. I happened to ask the herdfolk (as it was an unusual time to see a drove of cattle in the middle of the day) where they were going. The answer was, To Lal Jawan, (William Rufus)—a shrine at a place called Jhok. William Rufus took all cattle in to his clump of trees—cattle to be blessed from infection, and at the same time sick cattle to be cured. I endeavoured to reason gently with the graziers but was told that the ways of God and his ministers were wonderful.

I can only suggest "Teach the boys in school, and try, if you can, to win over the *mullahs*, but do not legislate at present."

(*e*) Serum often comes late, and dispensaries run short.

(*f*) No fee is charged officially.

(i) Please see answer to Question 1. Research (*a*) (ii). They used to say in Dera "*Uth Changa mal, khatte se a, khawe jal*" (A camel is a wondrous beast, lives on *jal*, and gives a feast (to its owner).) The extension of irrigation is spelling the doom of the camel.

(ii) Provincial Research Institutions are better than expanding a Central Institution. Walker and Taylor at Lahore have done a good deal for foot and mouth disease, which in England means ruthless slaughter.

(*h*) See (*g*) (ii). There is the Sohawa Laboratory for a Surra Specialist, but there is no Surra Specialist.

(*i*) No. Pray consider soil, climate, and humidity in a place like India.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) (i) I have seen Dajil (Dera) akin to Bhagnair (Sind), Hissar, and Dhanni (Jhelum) cattle, and for draught animals, the Dhanni is *facile princeps* sturdy breedy bullocks which go in large number to the canal colonies. Jhelum has a Dhanni breeding scheme—Board and subsidised bulls, Government giving a grant equivalent to the amount spent by the District Board, i.e., Rs. 4,000 per annum. The Veterinary Department might with profit keep an eye on the Dhanni bullocks in the colonies, and report whether the intenser heat in Lyallpur and Montgomery affects a strain reared 1,500 ft. above sea level. If the Dhanni breed can stand the Central Punjab heat—it can stand Sialkot where thousands of the blood go—may the Punjab Government be asked to take away the plateau on Mount Diljabba in the Jhelum Salt Range from the Forest Department to enable the Dhanni stud bulls "to walk the pasture in kingly flashing coats?" I would ask for the starting of a Dhanni pedigree herd book in Chakwal, and a Dajil herd book on the skirts of the Dhundi (Government) Estate. The Dajil bulls (well nurtured on the sweet great millet of the Dera hill torrent terrain) can certainly stand any heat. They are not the great leggy creatures that Hissar produces, and for a minimum of effort stand second only to the Dhanni in showing "what a track shows the upturned sod." But the cows (Dhanni) are also worth selecting. The worship of the sire can be carried too far. The bull calf in Jhelum gets its milk for over a year: the miserable heifer seems hardly to get any milk at all.

I am glad to say I helped to shock the Punjab Minister for Agriculture in this month at a cattle fair started two years ago by showing him the contrast between these lively sires, and the miserable cows, so gaping a gulf between the sire and the dam that you would never dream of at the Royal or the Highland, even with a Shorthorn cow or an Ayrshire bull. The Veterinary Department says: "Popularise first the Board bulls (25) and the stipendiary bulls (40)," but with 65 stud bulls, the cows deserve some honour. They do not deserve it at present, but they have never had a chance. There is room for a Dhanni farm both at Chakwal, and somewhere in the colonies. Cross a Dhanni sire with an Ayrshire-Montgomery half-bred, and have the heifer produce tested; that will be an experiment worth making; but at the same time try the pure strain, and have a few good heifers ready for the bull, and see whether the Dhanni breed cannot produce pure strain milch cows, to show up favourably in milk testing control. I hear the Commission is coming to Serai Alamgir on the 14th March. It will be a little march for them, but I will get one or two Dhanni bulls to come to greet them at the station.

(ii) Dairying is too ticklish a business to advocate without first experimenting. The Dhanni breed may be the poor milkers the cows are said to be, but a farm at Chakwal could try the pure strain and also crossing with an Ayrshire-Montgomery and formulate results.

(iii) Castrate, Castrate, Castrate—it can be done so easily nowadays. But do not castrate too early; it may do for sheep, but it does not do for bullocks. Talking of sheep, when we have some *alpage* in Jhelum

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in the Salt Range, Mount Diljabba and other places, I would like to see acclimatized merinos sharing the heights with the Dhanni bulls in the summer.

(*b*) (i) Cattle throve in Dera though the rainfall was only 5 inches. Rajanpur *tehsil* is a huge ranch—a light population, and a shepherd folk.

In Jhelum the hardy peasantry (fighters second to none in India) propagate too rapidly to permit anything but the barest pasturage for their herds and flocks, which pick up a precarious living on barren hills or by trespassing in forest preserves. The Fodder Specialist at Lyallpur a year ago wrote to me that he wanted to stock paddocks, &c., with the better kind of pasture grasses. I invited him to come and learn something about the soil, climate, humidity, &c. I have not seen him yet.

(iii) The population in Jhelum is too virile and fertile for anything like enclosed pastures in a district that reached its cultivation limit decades ago.

(iii) Silos are needed in Jhelum. The popularity of wheat lies in its straw, but, to tide over a bleak winter, simple silos and chopping machines are needed in Jhelum. In Dera, the hill torrent cattle generally get their amazingly sweet *juar* (great millet) *tanda*. The riverain and canal cattle, with miserable *parali* (rice straw) to live on, get worked to death on the wheat wells in the winter.

(iv) The winter is the hard time. Neither Jhelum nor Dera has much cotton, but both have numerous wells, and Japan *sarson* needs popularising.

(*c*) In Jhelum, December, January and February, and the same months in Dera, hill torrent terrain cattle, with their winter bellyful of *juar*, can go to the riverain and canals before the torrents begin to flow. Late heavy rains in September, as in last year in Jhelum, make it easy for cattle, even with a gap in the rains from the middle of September to the beginning of February. Seasons vary. At least a month is needed before young cattle can thrive after a period of scarcity.

(*d*) Simple silos have already been suggested. Chopping the millets will help. Freer facilities for cutting grass in reserved and protected forests under the management of the Forest Department (a commercial department).

(*e*) Indian farmers in the main are no fools. The canals and intensive well tracts cannot breed cattle: the growing of cereals, cotton, cane is more value. *Barani* places like Jhelum, and to an equal extent Dera, will ever supply the canal colonies with their plough cattle. That is a law of nature. But the improvement of fodder supplies against a rainy day can be taught and should be taught in comparatively precarious *barani* tracts.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*a*) In Dera, except on the wells in the winter, the average cultivator has a lot of leisure. The Baluch and Jat on the hill torrent terrain only needs to get his embankments and dams ready, and once the water is in the embanked field, the soil is just scratched and the crop is got. But they have to slave away at their dams during the hot summer nights when floods are abroad. The canal cultivation is very slovenly, and riverain cropping gives little trouble. The busiest time is the threshing. With a light pressure of population on the soil, the Dera people are as much graziers as agriculturists, and the vagaries of the climate, canals, and river are such that cultivators on the main have given up the unequal struggle with nature and do as little work as they possibly can.

In Jhelum, the folk are pretty busy throughout the year. There is no land to spare, except in Chakwal. The slack months are the winter

months, December, January, February, when cultivators repair their houses, sheds, and embankments, carry manure, make baskets, ropes, &c. Trade in cattle is carried on in these months. Holdings are small as a rule, and the cultivator does his best to get as much out of them as possible.

(*b*) None. I do not believe there is much time for the cultivator in a district like Jhelum, even though the climate is not so enervating as elsewhere. The subsidiary industry *par excellence* in Jhelum is shying stones at one's neighbour.

(*c*) Caste, social relations, conservatism, want of training and perhaps want of time. However, there is a future for lac cultivation in Jhelum. *Ber* trees abound. Some poultry rearing is done, there is a market for poultry with the railway and Grand Trunk Road, and the custom of not living in big villages but in little *dhoks* (a few families in a small hamlet) makes the keeping of poultry an easy business. Poultry rearing has a future in places in Jhelum. There is also a future for fruit. The plateaux have an altitude of 800 to 1,500 feet, and the hills have an average level of over 2,000. Near Choa Saiden Shah on a perennial stream, the Forest Department is in possession of a grassy *enceinte* which could be made into a magnificent fruit garden. Olives were put down by an enthusiast on a small grant many years ago, but the Forest people saw to it that they were ruined. There are no obstacles in the way except lack of demonstration, knowledge and training, and the failure to have the wells in Chakwal bored.

(*d*) Straw and seeds are wanted for the cattle. Out of the suggestions made in the question, the utilization of rice straw for paper might have a future in a district like Dera, where the canals grow rice and little else.

(*e*) In the Jhelum Salt Range, there are several coal mines, as well as the big Khewra Salt Mine. The Awans and others whose holdings are small get subsidiary employment in the mines, which are a stand-by for a rainy day. Unfortunately the coal industry is going through a bad time at present. It ought to be noted that probably it will be only in *barani* tracts that industrial concerns can afford subsidiary employment. In the colonies, I fancy, the cultivators go all out for cultivation, e.g., they buy their bullocks from *barani* tracts.

(*f*) Not at present, except fruit, poultry and lac in Jhelum.

(*g*) No.

(*h*) Enlist the sympathies of retired Indian officers who have seen the world, give suitable grants-in-aid to any village which can put up a sum or will undertake labour for payments and drains, lessons in the rural and night schools, and the extension of the rural community movement.

QUESTION 18.—AGRICULTURAL LABOUR.—(*a*) None, in my opinion. Labour, as it is, finds its own market. The Punjab is blessed with an excellent railway system.

(*b*) n Dera, there is a decided shortage. Influenza in 1918 played havoc with the district, which, however, has always been sparsely populated, with grazing as the main avocation of many of its residents. But, particularly with recent demobilizations, the Jhelum hills, e.g., will be quick to supply peasant colonists for the new Punjab schemes of Bahawalpur. However, the army by taking its men for five years only won't make soldiers out of them, and ruins them as cultivators.

(*c*) No.

QUESTION 19.—FORESTS.—(*a*) The Forest Department is a commercial department. In protected or reserved forests (or *rakhs* rather) under the charge of the department, grazing facilities are granted only to the extent compatible with the proper preservation of forest areas. Both Dera and Jhelum have numerous *rakhs*. In Dera, with its big distances and meagre

staff, a lot of illicit grazing and browsing goes on, and the *rakhs* suffer badly. The *rakhs* are a great stand-by in a dry year.

The supervision is stricter in Jhelum, and the *rakhs* are much tidier. But illicit grazing goes on all the same, though not much browsing. I see no objection to an extension of grass cutting facilities in the Jhelum *rakhs*.

The Forest Department and Settlement authorities make an effort to hit the mean between the two contending policies. I note the classification in Jhelum by way of illustration:—

Twenty-six rakhs. Classified as follows, with internal compartments:—

(*a*) *Rakhs* open to grass cutting throughout the year.

(*b*) *Rakhs* partly open to both browsing and grazing, and partly open to grass cutting.

(*c*) *Rakhs* open to grazing of cattle for part of the year.

(*d*) *Rakhs* partly open to the grazing of cattle, partly open to grass cutting only and partly open to browsing.

(*b*) The Forest Department might find it possible to hold wood auctions at more centres than at present, to give villages a chance of buying the produce locally.

Farmers to be encouraged to plant their own trees on village roads. The young trees might have a chance of surviving then.

The poor coal in the Jhelum hills is not used locally except for brick kiln work. Communications are so bad that local coal which ought to be cheap works out dear except near the mines.

(*e*) Not in Jhelum.

(*f*) Not from grazing. They suffer severely from browsing in Dera, where camels and goats abound.

QUESTION 20.—MARKETING.—(*a*) The only markets I know are markets in a small way of business. The market at Jhelum only began to flourish when it was taken out of octroi limits and placed on the Grand Trunk Road—with a great accession of business. What is wanted are facilities to get to market more easily. There is very little wheel traffic in either Dera or Jhelum in the country.

(*b*) I limit my answer to describing the existing system, and the channels through which produce has to go before it is sold. (i) the *Dharwai*, who weighs the produce and charges about 6 chittaks per maund; (ii) pack animals for transport, charge about 6 pies per mile per maund (expensive); (iii) the broker or *dalal*—brokerage charge anything up to ½ per cent.; (iv) *arhti*, commission agent charge 1/9 per cent.

There is one swindle, which is common in Dera, and I believe exists in Jhelum too. The village and threshing floor measures are measures of capacity—in multiples of four, *paropi*, *topa*, &c. These capacity measures are not standardized. In Dera they vary considerably in localities, and a good deal of confusion is so created—all to the loss of the cultivator. If it is too radical a change to insist on the use of standard weights, the capacity measures should be standardized.

(*c*) No.

(*d*) As far as Dera and Jhelum are concerned, I do not think there is any necessity.

QUESTION 22.—CO-OPERATION.—(1) (*a*) Increase the inspecting staff. Societies are growing apace.

(*b*) Regular quarterly meetings between officers of the department and the Deputy Commissioner and his assistants to be prescribed to discuss co-operation affairs in the district.

(*c*) Such steps to be taken as are possible to remove the apathy and obstructiveness of some civil courts in the matter of realizations, winding up societies, &c.

(*d*) Lessons in schools and night schools.

(ii) (i) Enlisting the aid of *maulvis*, (ii) retired Indian Officers.

(*b*) (i) No, except that the more societies that can be financed the better. The beginning was made in Dera in 1919, but in Jhelum, in 1924, I found Central Banks in all three tahsils, two of them quite sound. In Dera, in the early days of co-operation only a few years back, I too was a money-lender in the infancy of the Central Bank. But the first cash is really only the bucket of water which, in my boyhood days of the old draw pump, we used to pour down a new pump to set the sucker at work. Once the sucker is filled, there is plenty of water to draw from the soil, and I got my village society deposits back.

(ii) No experience.

(iii) No remarks. There are no middlemen except *dalals* when bullocks are sold, but a society for the sale of mules in Chakwal might be worth considering.

(iv) No experience, but I would like to say that, even in faction-ridden Jhelum, the custom of *wingar*—turning out yokes for building *bands* in a neighbourly way—obtains just as it did in Dera.

(v) There is an opening for such societies in Chakwal in this district, where soils are evener and more uniform.

(vi) None. Societies such as contemplated would not work in Dera, and even in Chakwal (Jhelum) much caution would be needed.

(vii) The one thing both Dera and Jhelum people will do is *wangar* (Dera) *wingar* (Jhelum)—pooling resources in building, say, a *bund* or the like. I have no experience of a society for joint farming.

(viii) I have advocated putting all the Board and as many of the subsidized bulls as possible at the disposal of Co-operative Societies. These societies have just begun to spring up. I would like to see all Board and subsidized bulls entrusted to one member of the societies, to be supervised by the society or society committee to see that the animal is properly housed, groomed, exercised, and dieted, and to see to its proper employment. The main object should be to produce Dhanni draught animals, but I would like "herd" cows also to be entered in the society's stud book and see the society expanding into the twin object (i) getting blood and bone into the bullock, and getting good milch cows as well.

(ix) Better living societies are very popular* nowadays object, diminution of extravagant customs and expenditure. These societies can easily become mere eyewash. I have had criminal cases with broken bones over their inception already, and when I once read in, possibly, the "Pioneer," that the Deputy Commissioner, Rawalpindi had issued a *ukase* forbidding more than the expenditure of a certain sum on marriages, I could only murmur "*Tantum potuit D.C. suadere malorum?*" No Deputy Commissioner or society can issue prescriptions against the conscience of mankind; you have slowly to educate that conscience.

(*c*) No.

(*d*) Yes, and that abundantly.

QUESTION 23.—GENERAL EDUCATION.—(*a*) (i) By the time a boy goes to a college, except it is an agricultural college, he is utterly divorced from the soil. He is even worse than a soldier, and he is lost to agriculture.

(ii) and (iii) It is particularly in the middle schools that a rural or agricultural garb is needed in the country. One hears of teachers being trained in nature study or in "civics," but what seems to be wanted in middle classes is sound instruction in the 3 R's, with useful information and its application to local circumstances. There is at present a complete divorce from home and school in the country middle and elementary schools. A country boy should get instruction in a farmer's accounts, farmers being notoriously bad at accounts, the calculation of interest, the measurement of a field, railway fares, bazaar transactions, &c. The teaching might be

* But see reply to Question 46,388 (page 827).

"ruralized" more—with rural subjects and rural occupations for the purposes of illustrations. Please also see answer to Question 2 (v).

(*b*) (i) By "Home work"—seeds, vegetables, poultry, and even having a calf for one's own.

(ii) It was just being introduced in Dera when I left in 1924: it has yet to be introduced in Jhelum.

(iii) At the age of 8 to 10, boys became useful to their parents, and they are taken from school. It is a moot point whether they are the better for it or not. Too often now even the primary-passed boy turns up his nose at agriculture.

QUESTION 24.—ATTRACTING CAPITAL.—(*a*) In the Punjab, capitalists—colonies I cannot speak for—are ruled out by the Land Alienation Act. The "Junkers" or squirearchy will only add to their broad acres. Government has got a lot of land to dispose of. Let some of it be given to practical horticulturalists, engineers, on conditions of mechanical traction only, for the upkeep of a herd, etc. The Land Alienation Act does stand in the way of capital being put into land.

(*b*) Lack of education and lack of means. Speaking of Dera and Jhelum (90 per cent. Mohamedan) I know few Mohamedans who are not in debt and few who can conceive that improvements are possible in the traditional system.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*g*) Village life is appallingly dull and brutish. That is why Jhelum people, almost in a spirit of waggishness, stone their neighbours.

With so many Indian Officers (retired) in Jhelum, it is worth trying to enlist their sympathies in the matter of sanitation in villages. When a village is ready to put down a pavement or some simple drainage system, and has partly done so Government should not be too finicky in asking for estimates, etc., before giving a grant. Some trust should be reposed in the Deputy Commissioner and District Board, that the grant will not be misapplied or wasted.

See paragraph 442 in the Indian Taxation Enquiry Report, Volume I. The principle should be, help those who are genuinely ready to help themselves, without any such red tape.

See what can be done with Rural Community Councils and enlist the aid of co-operative societies of good standing, and give selected teachers, particularly of communal high schools, the chance of giving lantern lectures and general extension lectures.

(*b*) Yes. I have an enquiry going on in Jhelum at the present moment, but the mistake made was at the instance of the Economic Board—in selecting a graduate from a town. This "townee" is not in sympathy with the country folk. The better agency for such enquiries would be, not a spoon-fed graduate, but a rural *naib tahsildar* candidate, with his spurs yet to win, and a country man by birth and breeding.

(*c*) None. I am still hopefully journeying, with no prospects of arriving anywhere.

QUESTION 26.— STATISTICS.—(*a*) (i) No. Everything is recorded satisfactorily enough as it is in the Punjab.

(ii) Under a kind rents system, which is only too common, stacks of information are available in the account books of landlords. A synopsis based on the exploration of such data has always seemed to me more valuable than isolated crop experiments.

(iii) The enumeration of livestock is too casually done at present. Take camels, for example, in Dera: it would take weeks to count them properly. The quinquennial enumerations should be made a serious business properly supervised.

(iv) No.

(v) No.

(vi) No.

Oral Evidence.

46,300. *The Chairman*: Mr. Wilson, you are Deputy Commissioner of Jhelum in the Punjab?—Yes.

46,301. On the first page of your note, you point out that the number of persons who can get to either Lyallpur College or to Pusa is necessarily limited. What view have you formed about the usefulness of Pusa as a Central institution? Would you like to develop that at all?—I have been in backward districts and there Pusa is merely a name connected with experiments and improvement of seeds and that kind of thing. None of my agriculturists have ever gone to Pusa I think; they come to Lyallpur occasionally.

46,302. And you find that the reputation and prestige of Lyallpur is high with the cultivator?—Yes.

46,303. Is there a growing confidence in the advice of the Agricultural Department?—The Agricultural Department in Jhelum has just begun its operations in that district, and when I was in Dera Ghazi Khan, the Agricultural Department had hardly begun to send their assistants to lecture and educate the country side.

46,304. What are the agricultural characteristics of your district?—It has a riverain stretch, a hill stretch and a plateau. There are a few wells, but the whole district depends for its cultivation on rainfall. The rainfall varies from 30 inches to 18 or so, as one goes further west from the Himalayas. The holdings are small; the district is thickly populated.

46,305. So that for the most part it is a typical *barani* area?—Yes, of the northern Punjab.

46,306. Do you feel that that class of farming has had a fair share of attention given to it by the Agricultural Department?—Not yet; the Agricultural Department is beginning to take up the Northern Punjab in a way which was not the case two years ago. The Agricultural Department is beginning to start demonstration farms, to send Agricultural Assistants and generally to invite my agriculturists to come to Lyallpur and see what Lyallpur is doing.

46,307. Are there any young men from that district studying in the College at this moment?—I think there are, but I cannot say for certain; I think I have got one man here, and I think I have also got another man in the fitters' class.

46,308. Do you form the view that it would be possible, with profit, to sink many more wells in the district?—I would prefer to have the present wells bored.

46,309. Extended?—To get a bore to go to the lower stratum; there is scope for sinking new wells, but there is greater scope for boring in the present wells.

46,310. Is there a very active demand amongst cultivators for sinking bores in the bottom of wells?—They hardly know of the possibilities. If wells were bored, I am sure the demand would be very keen, because the benefit would be so great.

46,311. How about the plant and personnel available for embarking on that work? Is that sufficient in your view?—We have not any plant at all at present.

46,312. Neither plant nor personnel?—No, with the exception of contractors who come from Lyallpur and Rawalpindi and occasionally bore a well at a cost of Rs.300 or so.

46,313. On page 803, in answer to our Question 1, you suggest the formation of an association of voluntary workers, for example, the Chakwal

association, for the improvement of agriculture. Have you had experience of starting a society of that sort?—No. I made that suggestion because we are going to have demonstration farms, and I thought that would be a very effective way of bringing the teaching home to the people in their own fields.

46,314. What class of persons would you suggest should be drawn upon for such an association?—Any agriculturists who would volunteer to work in co-operation with the farm instructors in making comparative experiments or in general working in association with the demonstration farms or the experimental stations.

46,315. Is there any difference between your suggestion and what the Co-operative Department are carrying out in the shape of their better farming societies?—I have no experience of better farming societies.

46,316. Is the Co-operative Department active in the Jhelum district?—Yes.

46,317. But you have no better farming societies?—No.

46,318. What vernacular middle schools are there in the district?—There are many vernacular middle schools in the district; I should say that, roughly speaking, we have nearly a score of them, but there is only one school that has got anything in the way of a piece of ground attached to it with some agricultural teaching being given in the classes.

46,319. And how long has the agricultural interest been awake in this middle school?—The school was started, I think, about three years ago, but it has never made much progress.

46,320. How do you account for that?—It is a novelty, and the land the school has got is about three acres with no facilities for watering the soil except from a neighbouring well, and the boys themselves in the middle school do not take any keen interest in agriculture unless they have a keen and really enthusiastic teacher to divert their interest to the field.

46,321. Your experience of this one middle school is distinctly disappointing?—Yes, but in the beginning most experiments are rather disappointing.

46,322. Was the teacher in charge of the agricultural work trained at Lyallpur?—He must have been.

46,323. You say, "But the land is tilled and watered by hired labour, and the boys only play at their allotments, which are not visible to the uninstructed eye"?—Yes; by that I mean to say that when I visited the school I asked two or three boys where their allotments were and they could not tell me; it looked more like an open field rather than pieces of land split up into little plots, each allotted to a boy.

46,324. Will you turn to page 805? You say: "Night schools for adult in the country are usually frauds. The teaching is undertaken by day school teachers, who are only out for extra allowances." Have you much experience upon which to found that view?—That is as a result of complaints received from the countryside. Very frequently the inspecting staff of the Education Department have not been in a position to deny the substance of the complaints when I have made inquiries from them.

46,325. Where do the complaints come from?—From members of the District Boards, *Zaildars*, and so on.

46,326. What do they say?—They say the school is not really carried on in the way in which the attendance roll would show, that the attendances are very casual and that the school really does very little good in most cases.

46,327. Is the attendance roll faked?—I suspect it; but that, of course, would all depend on the type of teacher.

46,328. Have you yourself ever walked into the class to have a look?—I am afraid I have not.

46,329. You judge from your experience that the co-operative night schools are as a rule conducted on better lines?—Yes, because a co-operative night school would start if the members of the society really wanted the school; whereas the night school under the District Board would probably start because the teacher wanted to have further activities. When a co-operative society has started, then we know there is a demand for a night school in that place, and the thing to do is to hand it over to the District Board as soon as possible.

46,330. Would you turn to page 806 where you give, in answer to our Question 4, para. (3), some facts about the expenditure on roads in the district. How do you account for the small amount spent as compared with the amount budgeted for? Do I understand the table aright?—Yes, that is so. The real reason is the inefficiency of the district engineering staff in a poor district. The staff is poor, consisting of a District Engineer who gets Rs.300 or Rs.350 a month, and under him there is one Sub-Overseer for each *tehsil*; it is a matter of experience that when contracts come up for sanction before the Board meetings, the members very rightly criticise them as being expensive and then the estimates again get canvassed about, and eventually at the end of the year we find the work has not been given out, or, if it has been given out, it has not been done in the way in which it should have been done. The remedy is to improve the staff. I ought to say that, in the neighbouring district of Shahpur, where there is a wealthy District Board, they have done a great deal in the last two or three years, but there they have equipped the Board with a most excellent staff.

46,331. *Sir Henry Lawrence*: What prevents that remedy being applied here?—We are endeavouring to get a better District Engineer, and to increase the *tehsil* staff.

46,332. But what prevents it at present?—Nothing really; the staff ought to be strengthened, and it is being strengthened.

46,333. *The Chairman*: On page 807, in answer to our Question 5 (*b*), you are talking about *taccavi* loans and you say that too frequently advances are not devoted to the objects for which the loans are made. How far is it possible to control that condition?—That can only be controlled by better supervision on the part of the *tehsil* agency, which is often a very heavily worked agency with a lot of other work to do.

46,334. On page 808 you are recommending *taccavi* as a means of financing the sinking of wells. You say: "There is not a tube well in Jhelum, and only one in Dera, sunk by a Hindu capitalist." Do you happen to know whether that well is successful?—When I last saw it it was doing very well indeed.

46,335. How deep is the well, do you know?—I think about 60 or 70 feet.

46,336. Do you happen to know the flow?—I cannot say.

46,337. Do you gather that the subsoil water in the Jhelum district offers opportunities for sinking tube wells on a large scale?—I cannot say until the experiment is made.

46,338. On page 809, in answer to our Question 6 (*c*), you say that the Land Alienation Act has defects which it is needless to go into here. Are those technical defects?—Minor defects; one difficulty is about dealing with the applications of people who are not notified as agricultural tribes but claim to be recognized as such. These, however, are difficulties in

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practice. I have only noted one main defect, which is a defect in the South-Western Punjab.

46,339. You say: "In the South-Western Punjab the peasants or a lot of the smaller fry have only exchanged servitudes. The 'gombeen' man has been told 'Hands off the land,' but there is the Mahommedan squire or junker in many of whom the passing of the Land Alienation Act has bred a perfect passion for consolidating large estates, buying up cheaply or simply appropriating Naboth's vineyards, and creating a vast landless proletariat." What is the largest estate of that sort which you can think of? Are there many large estates?—There are many large estates in Dera Ghazi Khan, but they were already large before the passing of the Land Alienation Act; they have been increased after the passing of the Act, and I think I can quote instances where in some cases they have been doubled.

46,340. Is that process going on to-day?—It was going on till the time I was in Dera Ghazi Khan, but I fancy that the pace has slackened of late.

46,341. If the Land Alienation Act were repealed to-morow, would the process be arrested?—No; but there would be another competitor in the field, and the vendors would find that they would get a better bargain for the land which they wished to sell to meet any of their necessities; this land goes cheaply at present, and these "engrossing" landlords are not "improving" landlords.

46,342. On page 812, in answer to our Question 15 (*a*), you say: "The Deputy Commissioner is never, or very rarely, an expert on agricultural problems, but he has his interest always riveted to agriculture." Is it your view that members of your Service in the Punjab regard themselves, broadly speaking, as responsible for the economic advancement of the people?—Yes, it is the foundation of their work; I mean criminal work ought to lessen as a rule if the economic conditions of the people are bettered.

46,343. Are you the Chairman of the District Board?—Yes.

46,344. Do you notice any movement in favour of a non-official Chairman?—I have just had a new Board elected, and I put the matter to the members the other day and they were not for it; as a matter of fact, in mysmall District Board, the rules do not allow a non-official Chairman to be appointed.

46,345. *Sir Henry Lawrence*: In any district?—The Government rules are, I think, that in District Boards in which 75 per cent. of the members are elected, the District Board on their option can apply for a non-official Chairman, but where the elected percentage is less than 75, then Government for the present has not given them that option.

46,346. *The Chairman*: On page 816, in answer to our Question 17 (*c*), you give it as your view that there is a future before the lac industry in Jhelum?—I think so; it is one of the things the Agricultural Department proposes shortly to take up.

46,347. Is there any lac cultivation at the moment?—No.

46,348. How about sericulture?—I have no experience of sericulture.

46,349. Would there be caste difficulties in connection with any extension in poultry farming?—None at all; a good deal of poultry farming already goes on in the scattered hamlets in Jhelum. Villages are not compact there they are scattered into a lot of hamlets.

46,350. What market do they supply?—The railway, Gujarkhan and Rawalpindi.

46,351. Is anybody interested in the improvement of the strains of fowls?—There is a Camel Specialist who has got a piece of ground near Lahore for the improvement of poultry strains in the Punjab.

46,352. Is he working at all in Jhelum?—The fowls are kept in the Camel Specialist's compound at Sohawa, and work is being done there.

46,353. In answer to Question 20 (*a*), on page 817, you say: "The market at Jhelum only began to flourish when it was taken out of octroi limits and placed on the Grand Trunk Road." What do you think was the obstruction to business before the market was removed?—It was inaccessible in the town with its narrow streets and it usually got flooded in the summer for weeks on end.

46,354. Who looks after the marketing when it is outside the octroi limits?—There is a private association of Jhelum merchants.

46,355. Is there a wall round the market?—Yes.

46,356. And the association presumably employs watchmen to prevent theft?—They do, but I am afraid they do not employ any sweepers and *bhistis* to keep the place clean; they employ watchmen; I have not heard of any burglaries there.

46,357. But the writ of the Municipal Council, if such there be, would not run in the market under those conditions?—No.

46,358. Ought not some provision to be made for keeping a market of that sort clean?—Efforts are being made now, but the market people themselves will not do anything beyond completing the well they are sinking, and the Municipality, being itself very poor, feels reluctant to spend money upon a site and a concern that has robbed its town proper of a great part of its trade.

46,359. But ought not the market committee to receive official recognition and have laid upon it the duty of preserving order and cleanliness within the market limits?—Yes, even now the Municipality can insist upon the market being kept clean and in order under the provisions of the Municipal Act.

46,360. It is within their territorial jurisdiction?—Yes, but beyond the octroi limits.

46,361. But I should have thought that if the Municipal Council felt a little aggrieved at the removal of the market from within the municipal boundary, nothing would give the Council more satisfaction than to insist upon the market committee spending enough to keep the market clean?—Most of the Municipal Commissioners concerned have big interests in that very market.

46,362. And that makes them broader minded in that matter?—Yes.

46,363. *Sir James MacKenna*: You complain of the bad quality of District Board Engineers that you get in a district like Jhelum. Are District Board Engineers in this Province recruited by the District Boards, or have you a separate service of District Engineers?—No, they are recruited by the Boards.

46,364. Do you think it would be a good idea to have a regular service under the Ministry of Local Self-Government?—Yes, it would give the District Engineer some *esprit de corps*, some status to stand on, and we would be able to get better men.

46,365. I understand that policy has been taken up in Madras since the introduction of the Reforms. On page 808 you give, as one of the reasons for agricultural indebtedness, this, namely: "the office of *lambardar* in non-canal tracts." Would you explain that?—My experience both in Dera and Jhelum is that all my *lambardars* get very little in the way of emoluments in the course of a year; often the sums are very trivial, being under

Rs. 10, and they get into debt. When I have inquired from them as to how they had contracted the debts, the reply usually was that it was due to carelessness in handling Government money, and the necessity of paying in the land revenue into the tahsil, and generally the burden put on the *lambardar* results in his getting into debt.

46,366. That is the cause of agricultural indebtedness in the particular case?—In these two districts, so far as the *lambardars* are concerned, they are in debt; that is not the case in the bigger colonies.

46,367. On page 816 you say: "Olives were put down by an enthusiast on a small grant many years ago, but the forest people saw to it that they were ruined." What process of destruction did the Forest Department indulge in?—There is this Rakh Gandhala, which is about 2,000 ft. high, a very fertile stretch of about 300 acres, with a stream flowing through it; the olives were planted on, I think, a stretch of 30 acres, but it so happens that the forest ranger and other forest subordinates have their quarters in this *rakh*, and they objected to another company, as I think it was, coming in and taking a piece of the most valuable grazing ground in the *rakh*. Otherwise the olives might have been successful. I believe that is the fact, and that is why I put it in my note.

46,368. *Professor Gangulee*: On page 805, you make reference to the Rural Community Council; do you consider that this organisation has a promising future in your district?—It has yet to be seen; the organisation has just begun; nothing has been done yet, but we hope that in connection, first of all, with a scheme of the Punjab Government called intensive *zails*, we shall get the organisation to start with regard to sanitation, extension of adult education, and the objects of the Rural Community Council.

46,369. Do you see signs of the villagers taking a live interest in this Council?—It really has not begun yet, but I think there is a possibility for it, even in a faction-ridden place like Jhelum, if concentrated work is done in a particular *zail* and the consciousness of the people is awakened. You cannot waken a district straight away; you have to make a small beginning; I think even in Jhelum there is scope for Rural Community Council work.

46,370. Do you think you will be able to enlist the sympathy of the retired soldiers and pensioners?—I think so, certainly in regard to improved sanitation; they have seen the world and they know that improvements are possible in the dirty state of villages.

46,371. Do you find that the standard of living and social outlook of pensioners and men who have had military training are superior to that of the other villagers?—Decidedly.

46,372. On page 805, you refer to dry gram cultivation, and say that in recent years it has achieved great popularity. Who took the initiative in this direction?—I do not know; I think it began in the light loam, and even in the sandy tracts in the Mianwali district; but I do not know who took the initiative.

46,373. It is not the result of departmental activities?—I would not like to say it was not, but I really do not know.

46,374. On page 806, you suggest that the Agricultural Service should keep the head of the district informed about departmental activities. What is the present situation? Are you not in touch with the Agricultural and Veterinary Departments?—I am in touch with them, but I would like something more in the way of monthly or quarterly conferences with the Agricultural Department, the Veterinary Department and the Co-operative Department, just to discuss what has been done, what difficulties are being experienced, and perhaps what the Deputy Commissioner could do to assist

the departments. At present I think the departments, particularly the Agricultural Department, are inclined to look more to the Deputy Director in Rawalpindi than to the Deputy Commissioner, who, after all, is the neighbour of the local representative of the Agricultural Department and is always living next to him.

46,375. Does the Deputy Director of Agriculture never call on you and discuss problems of agriculture with you?—He does, when the Minister comes, and occasionally on other occasions throughout the year.

46,376. You say that Jhelum has over 10,000 pensioners. What do they do after they retire from the service? Do they take to agriculture or stock-breeding or anything of the sort?—It is a very difficult problem; they have got nothing to do; they look after their small holdings. They often have very little to live upon, and the demobilisation in recent years has made the problem in the Jhelum district a very difficult one.

46,377. You say that the Land Alienation Act has created a vast landless proletariat; could you tell us whether that Act has increased the number of agriculturist moneylenders?—There were no agriculturist moneylenders in Dera and Jhelum, as far as I know; the only agriculturist who finances the *bania* or does anything of that sort is the wetlhly retired Indian Officer. I have not much experience of that; in fact, I have come across very few agriculturist moneylenders.

46,378. I understand the problem of fragmentation of holdings is not very serious as yet in your district?—It is serious enough, because we follow custom or Mahommedan law, and by that law fragmentation is bound to go on.

46,379. On page 812, you say the Civil Veterinary Department should be under the Direction of Agriculture; and then in the next sentence you say that the two departments are too much at cross purposes at times. Have you any knowledge of such conflicts between the two departments?—We have had a cattle-breeding scheme in the Jhelum district which has been run in the past by the Veterinary Department, and I have seen representatives of both departments discussing with some acrimony the future of this cattle-breeding scheme and who should really have charge of it. It was quite friendly, but there was a certain amount of opposition between the two departments.

46,380. How would you obviate that difficulty?—I have not thought about it; but I think that if you had at the head of the Veterinary and Aricultural Departments the Director of Agriculture, and the two departments working on their own lines, but under one controlling authority, it might be a good thing.

46,381. You would not like to see the two departments separated?—The Veterinary and Agricultural Departments are separated at present.

46,382. Do you want the Civil Veterinary Department separated from the Agricultural Department?—No, I like them to be together, because after all, the cattle problem is a part of the general question of the development of the land, and the two departments should work for one and the same object.

46,383. The most promising breed on the other side of the Jhelum is the Dhanni breed, is it not?—Yes, that is so.

46,384. Has any work been done to improve that breed?—The District Board has purchased its own stud bulls, about 25 in number; we have also got about 50 stipendiary bulls which are at the disposal either of co-operative societies, or of men interested in the bull who will attend to it and its services.

46,385. Do you find that the members of the District Board are keen in the matter of cattle-breeding?—They are keen, because they love their bulls; they have no love for horses, as was the case in Dera.

46,386. So there is a demand for good Dhanni breed bulls?—Yes, because they sell their young stock in the canal colonies like Lyallpur, where it is not profitable to try and breed cattle.

46,387. On page 815 you say that silos are needed in Jhelum; have any experiments been made in that direction?—That, again, is another future venture of the Agricultural Department; it should be simple silage, nothing very elaborate. Nothing has been done.

46,388. On page 818, you make the very interesting remark that better living societies are very popular nowadays, the object being the diminuation of extravagant customs and expenditure. Is that right, that better-living societies are very popular?—That has been mistyped; what I ought to have said is that in the past year they have been very popular with the Sub-Inspectors of the Co-operative Department.

46,389. *Mr. Calvert*: Is it sometimes the case that the popularity with the Sub-Inspector is reflected in a little case in the criminal court later on?—Yes; there was a case when one of the societies was being founded; the Sub-Inspector went round and asked the proposed members to put their thumbmarks on an agreement that they would abide by the rules. One gentleman was putting his thumbmark on when his neighbour said to him: "That is all very well, but you have just got your marriage over, and it is your turn to do your share in marriage expenditure." That resulted in a broken head and a broken wrist.

46,390. Have you ever been at Lyallpur before?—I came here in 1913 with a crowd of Baluchis from Dera Ghazi Khan.

46,391. And took them over the farm?—Yes.

46,392. Is there much similarity between the local agricultural conditions in Lyallpur and Jhelum?—I know very little about Lyallpur; but our conditions are these: we have got small holdings except in Chakwal, and the system there on the *barani* lands, which are our main lands with the exception of well lands scattered along the riverain, is the two years' course; you get a spring crop and then an autumn crop; then the land lies fallow for the year, and then the same thing again. That is the general custom upon *maira* lands, which, I suppose, in Jhelum constitute about 80 per cent, of the cultivated lands in the district; there is no double cropping.

46,393. It is mostly a shallow, rocky soil, is it not?—No, it is a soft, nice loam in Chakwal; in the *khadar*, i.e., broken ravine land, the land has been made largely by putting up *bunds* and collecting the detritus in the hills, by putting up stout or earthwork *bunds*. In the Thal, the soil has been ruined by the Salt Range infiltration.

46,394. You have special local difficulties in Jhelum?—Yes, particularly this *khadar* broken land and the absence of any plateau. Lyallpur is one vast plain; Jhelum has only two small plateaus; the Pind Dadan Khan *tehsil* has one plateau, the Thal, which is largely barren, and Chakwal is a broken plateau.

46,395. Do you know how the cattle-breeding societies are doing in Jhelum?—They are only in Chakwal at present; I hope they are doing well, because the Co-operative Inspector has been transferred and the new man is taking an interest in it. I have asked the co-operative societies to do their best to look after the cows; but the Government give a bull or a tup, and ask the society to do something in the way of selecting females.

46,396. What about sheepbreeding in Jhelum?—I think there is a future for sheepbreeding in Jhelum, because we have got our hills, we have got

our grasses 2,000 feet up in the *rakhs*. After all, in Jhelum there are, I think, about two lakhs of acres under the Forest Department which produce poor fuel, some grazing, some grass-cutting; but when you have the possibility of giving summering to your sheep on the hills, I think something could be done in Jhelum. A society has been started in the plains, a rural society; I do not think it has done much.

46,397. Is the Merino cross becoming popular?—We have not got one.

46,398. Your big difficulty is the fear of fodder famine?—It is a menace always in Jhelum.

46,399. Can you see any way of avoiding that?—Better conservation of fodder, chopping fodder, having silos for millets. We have got a lot of millet in Jhelum. When the pinch comes, the *rakhs* should be opened generously for grass-cutting, if you cannot allow grazing.

46,400. *Mr. Kamat*: For how long have you been the Chairman of your District Board?—2½ years.

46,401. You say the percentage of net income spent on roads by your District Board was 4·9 in 1924-25, and 7·6 in 1925-26?—Yes.

46,402. You say that the state of affairs is very unsatisfactory, which means that the roads are bad because your finances are bad?—The roads will always be bad in Jhelum because we have such a broken, rugged country; but I admit that no improvements has been made in the past two years, because, having got rid of one inefficient engineer, I have been unlucky enough to get a worse one.

46,403. Do you mean to say that if you have a good engineer but the same state of finances, you would be able to do considerably better?—Yes, decidedly; I think with a good engineer and with a little better staff in the field, our budget for the roads could be spent and spent with profit. One does not want to spend it ineffectively. We budget the amount at present, but we do not spend it.

46,404. Is there any such thing as a tax on wells in your district or in this Province?—No, there is no specific tax; wells are assessed to a well rate, which may be in the form of *abiana*, as it is called, or in the form of an enhanced assessment, but there is no specific tax on wells.

46,405. If a man sinks a well for the improvement of agriculture, there is a sort of enhanced assessment?—If the tract is under a fixed assessment, automatically no assessment can be imposed upon the well until the next settlement; but if the tract is under a fluctuating assessment, a protective lease is given to the sinker of the well, which enables him to pay at the old dry rate for twenty years.

46,406. Do you not think that an enhanced assessment on a man who sinks wells is nothing but a tax on his improvements?—There is not any enhanced assessment. As I tried to explain, if a man sinks a well in a tract that is under a fixed assessment, until the settlement comes no additional land revenue is put upon that well, and at settlement even, if sufficient period has not passed to allow the sinker of the well to recoup himself for his expenditure, a protective lease is given for a little period even after the new settlement; and if there is a fluctuating land revenue rate on the countryside, the sinker of the well will not pay the *chaki* or well rate; he will go on paying the old dry rate for a period that is fixed by Government. So that the well after being sunk does not pay any enhanced rate for a period, which is usually twenty years, by which time it is considered that he has got a return for his capital.

46,407. Is there any complaint in this Province that the incidence of ordinary land revenue is one of the causes of agricultural indebtedness?—No. I was asked last year to report on the prospects of getting canal water

through the *tehsil* Pind Dadan by a hydro-electric scheme that Government is considering, and one of the questions I had to put to my people was, would they be prepared to pay Rs.8 *abiana* on what is not good land. They said they would willingly pay Rs.8 per acre *abiana* if they only got the priceless boon of canal water.

46,408. On page 819, with reference to the Board of Economic Enquiry, you say the "townee," or the spoon-fed graduate, is not the proper agent for conducting this enquiry, but the *Naib Tahsildar* candidate is the proper man. Should this sort of enquiry be conducted, by you, by the revenue official or by an independent man trained in economics?—It is hard to say; I can only judge from my own experience. My man at present comes from a town, and I admit I gave him a difficult village to do, but it was an interesting village; he has always been at sea, and I have often felt that if I had a *Naib Tahsildar* candidate, the two or three months that are wasted in trying to introduce a man to the system of land revenue records in order that he should get his facts about the village would have been saved.

46,409. Is the Tahsildar necessarily a man with a rural outlook?—I think so, because his whole business is with the rural people.

46,410. After he gets into the service?—Yes.

46,411. *Mr. Roberts*: With regard to crop-cutting experiments, I notice you say it would be quite easy to get records from landlords' books and so on, without resorting to these crop-cutting experiments. Do you think that would cover the whole of the two districts of which you have experience?—I want the two things side by side, the crop experiments and the *dhanwai's* accounts. I was merely referring to my own efforts in Dera Ghazi Khan to get some accurate and fair yield; I found in going through the *dhanwai's* accounts in *batai*-taking areas that one did get a volume of data from which one got a synopsis that was helpful.

46,412. And quite reliable?—Not quite reliable, but very helpful.

46,413. As regards your problems in Jhelum, do you think that an engineer with irrigation experience to survey and improve your irrigation systems would be of great benefit to you?—We would welcome some engineer lent to the district in connection with the Lifts Department of the present Minister for Agriculture. We have no canal irrigation in Jhelum at present.

46,414. Would you regard that as one of the biggest things you could do in your district at present?—May I ask what his function would be?

46,415. To help in improving the systems you have there. You have a number of systems of irrigation run by the cultivators themselves and some not developed at all?—We have only a few wells in the district; the rest is all *barani*.

46,416. Hill streams?—Yes, there are hill streams issuing from the Salt Range that do nothing but damage; the water is sweet at the source, and it has often struck me, and I have made the suggestion to Government, that an engineer might be deputed for three months to see whether he could not flume those streams in order to get the sweet water into the plains. At the same time, another scope for an engineer would be in the Chakmal *tehsil* to see what is possible in the way of damming the hill torrent streams we have there in order to *shamilat*, or grazing grounds, brought under good pasture.

46,417. *Sir Henry Lawrence*: On page 816 you say: 'Olives were put down by an enthusiast on a small grant many years ago, but the forest people saw to it that they were ruined." What do you suggest was behind their objection?—It was the Forest Ranger's work; he had his own cattle there, and he did not want any strangers coming in to a very fertile piece of land which was of value to him.

46,418. You do not suggest that the Forest Department had any policy which was interfered with by olive cultivation?—No, they were hoodwinked by their own subordinates.

46,419. What was done to ruin the olives?—This experiment failed in 1917, I believe; whether the olives were cut, or whether the water was diverted from them, or what was done, I do not know; it was before my time; but I know the experiment failed, and the local people say with certainty that it was due to opposition on the part of the local forest people.

46,420. But for that opposition, do you think the olive experiment would have succeeded?—I am not an expert on olive cultivation, but I am sure that on that same patch of ground there is a great opportunity for a magnificent fruit farm; there were 200 acres 2,000 feet above sea level.

46,421. Is this in the Jhelum district?—Yes.

46,422. *Mr. Barron*: It is rather an out-of-the-way spot, is it not?—It is only ten miles from the Khewra railway head.

46,423. *Sir Henry Lawrence*: Do you know anything of the success or failure of olive cultivation over the border in Kashmir?—No.

46,424. Are there wild olives growing in Jhelum?—I believe there are.

46,425. You were in Dera Ghazi Khan for some considerable time?—Yes, 10 years.

46,426. Is there any egret farming done by the Mohanas or local fishermen there?—Yes.

46,427. I do not think you have mentioned egret farming in your note?—No, I have not; there are two farms that I know of.

46,428. Can you tell us anything about that industry?—The feathers are sold to the merchants, the Sukkur people I think. I believe it is a profitable industry; the farms are not at all on a large scale; the feathers go down to Sukkur; where they go after that I do not know.

46,429. Have you ever visited a farm of that kind?—I saw the farm on the borders of Rajanpur, close to Sind, when I happened to be touring there.

46,430. Is there any cruelty in the breeding of those birds?—I have always understood the only cruelty was the actual extraction of the feathers.

46,431. Is that cruel?—I do not know; I cannot say whether it is a very violent pain.

46,432. Feathers are extracted from ostriches, are they not?—Yes.

46,433. Is that cruel?—I cannot say

46,434. Is there any difference between an egret farm and an ostrich farm with regard to the cruelty in the extraction of feathers?—I cannot say at all; I have not seen feathers extracted from egrets, and I know nothing about ostrich farming.

46,435. You do not know that the egret moults its feathers and the feathers are extracted at the period of moult?—I did not know that.

46,436. On page 808 you say that the "Civil Courts in the Punjab, which bear the bulk of the money suits, are largely staffed by kinsfolk and friends of the moneylending and shopkeeping classes." Is the suggestion that justice is not done to the agriculturist?—I would not go so far as that; I simply point out that with regard to realisations, when applications are made by the co-operative societies in Jhelum, there have been one or two courts in which difficulties have been put unnecessarily in the way of the Sub-Inspector; I do not think the help that one thought one might invite from the Court in the way of justice and fairness is always given when application is made for realisation of money in liquidation cases or other cases.

46,437. Is the inference to be drawn from your statement here that you wish to see the staff of these Courts recruited from the agricultural population?—Yes, I think so; the Courts are dealing with agriculturists and their debts, and it seems only fair that the judicial staff should have a sufficient percentage of agriculturists on the Bench.

46,438. Is it the policy of Government to follow the suggestion you have made?—I do not know about the policy of Government; in districts we simply get the Sub-Judges that are sent to us.

46,439. Has not the policy of Government in this matter been debated in the Legislative Council?—I think it has.

46,440. You do not read those debates?—Not habitually.

46,441. Is it a further inference to be drawn from your remarks that you consider the Civil Court is unsuitable to such a district as Dera Ghazi Khan?—I have no experience of civil work; my work is criminal and revenue; but in Dera Ghazi Khan, as a matter of fact, we had the old *jirga* system which often solves very difficult cases which would otherwise be difficult of solution under the processes of the ordinary law, whether civil or criminal.

46,442. Is the *jirga* system applied to disputes between Hindus and Mahommedans in matters of money?—Never, I think, in my exprience.

46,443. Can it be so applied?—Yes, if the executive authorities thought fit to appoint such a *jirga*, but it is not the policy to appoint a *jirga* in Dera Ghazi Khan or anywhere else to deal with money suits between moneylenders and agriculturists.

46,444. The *jirga* is confined to matters of bloodshed?—Bloodshed, women, land occasionally, dacoity, and fights.

46,445. *Sir Ganga Ram*: There are tube wells sunk in Ranjanpur *tehsil*?—I believe there is another one in Rajanpur, but I do not think it has worked.

46,446. The owner came to me for advice; he said it did not work; why did not it work?—He used rotten material that he had got from a scrap heap.

46,447. He sank a tube well; was it not done through the Agricultural Department?—No, there are two wells; there is Dharm Chand's in the Dera Ghazi Khan *tehsil* which from the first worked very well, and there is this other tube well near Rajanpur which has never worked to my knowledge, because the whole of the material was rotten.

46,448. He did that work himself: he did not do it through the Agricultural Department?—No, both the wells were sunk on the initiative of these two capitalist Hindus.

46,449. Have wells been tried in the *kallar* land of the basin of the Indus?—No, because there is such a tremendous flood in the summer that the whole thing becomes one sheet of water.

46,450. Under the scheme in 1911, when at the request of Sir Louis Dane, you made a report about pumping from the Indus, in order to get a perennial supply for Dera Ghazi Khan, nothing has been done?—Nothing has been done; that scheme died an easy death, I think.

46,451. In your opinion, are these inundation canals sufficient for the district, or can they be enlarged?—They are quite sufficient; the great thing about inundation canals is that if you can get a cold weather supply, by all means try to get it, and do not refuse a cold weather supply to cultivators on the ground that your canal wants clearing or repairing.

46,452. I am told that the duty on those inundation canals is very small, because sufficient control is not kept on the water; is that so?—That is so; the duty is very low.

46,453. Why is that so? Will not the Canal Department keep a good control over the outlets and so forth?—There is a great deal of land, very few cultivators and uncertain supplies; when the river goes down, you may have the canal practically dry for two weeks or more.

46,454. And they do not do any pumping from the river or canals?—Pumping from the rivers cannot be done in the summer; the whole thing is too uncertain.

46,455. You are aware of this scheme in connection with the Jalalpur Canal?—I am.

46,456. They applied to me saying they would be prepared to pay Rs. 10 an acre, although of course in the scheme we have only put down Rs. 7?—Yes.

46,457. Do you think Rs.10 would not be too high, that they would gladly pay Rs.10? Will that land stand so much as that?—I should not like to say; I am sure they would pay Rs.8, and in the hope of getting canal water they would say they would pay Rs.10 per acre, but I think Rs.10 would pinch the cultivator.

46,458. In the event of that canal being constructed, what would be the increase in revenue? Would you not double or treble the land revenue?—Yes; in the tract for which the canals are proposed at the next settlement, a heavy reduction in land revenue will be necessary.

46,459. That is if the canal is not constructed?—Yes.

46,460. But if the canal is constructed, would you double the revenue?—I cannot say; there is bound to be a large increase in land revenue apart from *abiana*.

46,461. Has no one advised you about the reclamation of ravines in the Jhelum district? There is a machine for terracing it; has that been tried?—No; but I do not know quite what you mean by reclamation of ravines.

46,462. By terracing it?—Our ravines are very abrupt and rugged, and where terracing has been possible the cultivators have made wonderful works of stone in the most unlikely places; I have myself seen terracing being done on stony soil that I would have thought was not worth a penny, but gradually the soil is forming; that has been done by local initiative.

46,463. You are not aware of any machine to do it?—No.

46,464. Do you not think that instead of giving *taccavi* direct for the construction of wells, in which case the money is not economically spent, Government should construct the wells and charge 4 or 5 per cent.?—If Government would do that, I think that would be all the better, particularly in regard to bigger works.

46,465. At present, the whole of the *taccavi* does not reach the applicant; there is a certain amount of leakage on the way?—I am afraid there is.

46,466. What is the difference between *barani* land revenue and *chahi* in your district?—*Barani* is usually a rupee an acre, while *chahi* is double that or a little more.

46,467. How many acres does a well command?—Very little; I think my wells throughout the district only command, say, 4 acres; the water is often deep. I ought to say I think the *barani* rates are more; the *maira* (*barani*) rate is about Rs.1-4-0, and the *chahi* rate is probably on the average double that.

46,468. You have not thought of starting myrabolams cultivation in your district? There is an enormous export of that to America. Do you call it *hari* or *jungli*? It grows wild?—I have not heard of that.

Mr. W. R. Wilson.

46,469. You speak of trouble with regard to District Board Engineers; would you support the idea of creating a service of District Board Engineers throughout the Punjab?—Yes.

46,470. We recommended that, but there was opposition because some Deputy Commissioner wanted to have the appointment and everything in his own hands?—I think those Deputy Commissioners, judging from my experience, were very foolish.

46,471. *Sir Thomas Middleton*: I judge from your precis that you have given special attention to animal husbandry. What more can be done for the camel than is now being done? You point out, I think, that more work on surra is necessary?—I think the camel in the Punjab is gradually being eliminated by the extension of canals; it cannot flourish in a humid climate, so far as I know. I would like to have an assistant in the surra laboratory; since Major Crosse left the laboratory four years ago, the assistant has been working by himself; I do not think he is the type of man who can go to Muktesar and other places and put the results of his work before Bio-chemists, Botanists or Entomologists in order to enable him to work on really effective lines. At present, he is trying to show how long an artificially infected tick can give surra without having any food; it is very interesting, but I feel one does want a proper man in charge of this laboratory, if there is going to be really effective research.

46,472. Is there anything else that suggests itself to you that we might do to assist the camel?—No. I think surra might be more adequately investigated, and as for the camel, he is being extruded from the Punjab proper. He used to flourish in this area at Lyallpur when it was a vast *bar*, but now it is a vast tract of canal irrigated land.

46,473. You give us a very graphic description of the Dhanni and Hissar breeds, the former being described as sturdy breedy bullocks, and the latter as great leggy creatures. What is the characteristic of the Dajil?—They are a little heavier animals than the Dhanni, but appertaining more to the stocky Dhanni than to the very big leggy Hissar animals.

46,474. You say that the cows of the Dhanni breed are universally neglected?—Yes.

46,475. I think you describe them as miserable animals, while the bulls "walk the pasture in kingly flashing coats." How can such fine animals have been the progeny of poor dams? Is it not proof that the cows are good if they are properly treated?—Yes, if the cows are properly treated; one hopes that the cows will again get the honour that is due to them, but at present the cows are very very miserable specimens; but, as you say, the cows must have something in them to have been the dams of these bulls.

46,476. Your attention has been directed to getting some method of selection adopted for the cows that are to be mated with the District Board bulls?—I have asked the co-operative breeding societies to concentrate on the selection of the dams for breeding.

46,477. Do the hills in the Salt Range to which you refer afford good sheep pasturage? Are the sheep there at present of a good type?—Yes; there are a good many sheep in the hills, but not of good type.

46,478. *Mr. Calvert*: Is that the Dumba sheep?—No. There are more sheep than goats in the Salt Range, I think.

46,479. *Sir Thomas Middleton*: Your view is that the demonstration farm should always do some experimental work?—Yes.

46,480. You feel that there are so many problems to be tackled in the Punjab that they cannot be centralised, and that each manager of a demonstration form should have some experimental work in view?—Yes,

with reference to the soil and climate of the place in which he has his demonstration farm; that would make it a more lively institution, I think, than it would be if it were simply an educational institution saying, "We have got this thing and you must follow it," there being no room for experiment locally.

46,481. You differentiate between agricultural education and education for agriculturists, and I take it from your remarks on general education that your view is that much more should be done through the medium of the vernacular for the instruction of agriculturists?—In the countryside all the education, even nowadays, is through the vernacular; English schools are just springing up.

46,482. You think much more use should be made of the vernacular in giving instruction of the kind that is required by the agriculturist?—Yes.

46,483. That is what you are arguing for?—Yes, there should be more rural education having reference to the every-day problems that crop up in the life of a farmer's son or of a farmer.

46,484. You point out as regards education in English that when a boy goes to a college, unless it is to an agricultural college, he is even more lost to agriculture than a soldier is?—Yes.

46,485. On page 807, with reference to long term credit, you emphasise the point that the instalments should not be spread out over an excessive period. What would you consider an excessive period? Is twenty years excessive?—It depends largely upon whether the improvement is a visible improvement still functioning.

46,486. Take the case of a well?—I should think fifteen years ought to be the limit; it should be from twelve to fifteen years.

46,487. *Mr. Barron*: When you say that the Civil Veterinary Department should be placed under the Director of Agriculture, what kind of a Director are you thinking of? You know of course that the Civil Veterinary Department is at present under the Director of Agriculture?—I did not know that; I thought the departments were working separately.

46,488. Are you thinking of a Director who would be neither an officer of the Veterinary Department nor of the Agricultural Department, but an outside officer co-ordinating the two departments? Is that what you are thinking of?—No, I was only thinking that as the Veterinary and the Agricultural Departments have one and the same object, getting out of the land as much as possible, there might be one general Director, whether he were a co-ordinating officer or an agricultural expert.

46,489-90. The Chakwal *tehsil* is, I think, the centre for the Dhanni breed?—Yes.

46,491. And is not the difficulty there that the people, owing to the difference in value between a bullock and a cow, will not feed the female properly when she is young?—That is largely the difficulty; a trade is done in bullocks, the bullocks are profitable, they are sold to the colonies, and all the milk and care is given to the bullock; the heifer is neglected.

46,492. Are you aware that the greater interest lately displayed by the Veterinary Department in the matter of cows and heifers to which you refer is perhaps due to the visit of an officer who belonged to neither of these two departments to Rawalpindi last year?—No.

46,493. You referred just now to the research work and experiments at Sohawa; you know that Government is trying to obtain an officer to take the place of Mr. Crosse?—I am very glad to hear it; I did not know.

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46,494. Poultry breeding is a great industry in Jhelum and Gujar Khan, is it not?—It is.

46,495. A great deal of the poultry supplied to Simla comes from Gujar Khan, does it not?—I do not know that.

46,496. The platform at Kalka railway station is almost every day covered with baskets of poultry from Gujar Khan?—I did not know that.

(The witness withdrew.)

KHAN BAHADUR CHAUDHRI FAZL ALI, M.B.E., President Gujrat Central Co-operative Bank.

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION.—(i) No.

(ii) Yes; almost in each district of the Punjab.

(iii) Yes.

(v) Graduates should be given preference in various Government departments.

Agricultural education should be such as would enable a student to increase the outturn considerably.

(vi) Yes.

(vii) Yes; the medium of instruction should be the vernacular. The curriculum should be so modified as to contain more of practical training in agriculture.

(viii) All are useful.

(ix) They are mostly in Government service.

(x) It will attract middle class youths only if it can be made paying.

(xii) A suitable curriculum should be carefully prepared according to the local conditions.

Special prizes should be awarded on attaining a special standard.

Effective propaganda should be carried out by means of magic lantern lectures, &c.

Teachers should be remunerated according to the literacy certificates issued.

The teacher should be at liberty to teach the adults at any time and at any place.

Everybody who teaches an adult up to the stage of acquiring a literacy certificate should be entitled to a fixed remuneration per student without any condition.

(xiii) Free compulsory education should be introduced. Local sub-committees should be formed to supervise the education as required by law. It should be financed by Government grants, grants from District Boards and by a little extra increase in local rates for education alone, if needed.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*a*) (1) Propaganda work and opening of demonstration farms and seed farms by the Agricultural Department.

(2) Propaganda work and starting of better farming societies by the Co-operative Department.

(*b*) Effectiveness can be increased if the demonstration farms are run on a sound basis and can show a considerable increase in income over expenditure.

(*c*) If experts are provided to give advice to the zamindars free, and their suggestions really prove beneficial, and proper facilities are given to them for the execution of the suggestions given by the experts, then the *zamindars* can be induced to follow such advice.

(*d*) In the Gujrat District, in some villages, Meston ploughs and some other modern implements of agriculture have been adopted. American cotton and some grain crops are being sown in lines. Harrows and drills have been adopted. Some better farming societies have been formed by the Co-operative Department, as a result of propaganda by the Agricultural Department and the officers of the Co-operative Department. It has been proved a success.

QUESTION 4.—ADMINISTRATION.—(*b*) Yes. The services of the experts will benefit every branch of the work, i.e., cultivation, gardening, sericulture, poultry farming, &c. They will also explain to the zamindars the suitability of various lands for various purposes, and tell them what is useful for which crop and also how to improve bad soil. The work may be controlled by the Co-operative Department, who may be given some knowledge of agriculture so as to put them in a position to advise the people to work and act on the advice of the agricultural experts.

(*c*) (i) The Agricultural and Veterinary Services are not properly provided for.

(ii) The railways do not pass through some agricultural tracts where they are most needed.

(iii) Roads are insufficient and the *zamindars* do not get the market price, even in India, on account of lack of means of road communication.

(v) Post offices are also insufficient. People in rural areas are not fully benefited by those. The telegraphic facilities also require improvement.

Improvements can be made by increasing the number of agricultural experts and Veterinary Assistants. They should be given charge only of such areas as they can supervise well. They should be controlled and supervised by the Co-operative Department.

Railways should be provided in tracts where they are most needed. Road communications should be increased; culverts should be erected on the roads wherever necessary. Post and telegraph offices should be opened, at least in those villages where middle schools of any type are in existence or opened. Agricultural and co-operative associations should be formed in every district and their advice should be taken in all agricultural matters.

QUESTION 5.—FINANCE.—(*a*) Agricultural co-operative societies (better farming co-operative societies) should be opened under the Co-operative Department. They would finance, and provide agricultural facilities to the zamindars in the form of implements, machines and all other such things but cash. The duration of this loan should be according to the economic condition of the zamindars, with the stipulation that so long as the full price of the articles lent is not paid, they would be the property of the society. The co-operative societies should not insist upon giving the loan for short terms, as it would debar the zamindar from taking loans from other sources.

(*b*) Facilities should be provided to the zamindars to get *taccavi* at a very low rate of interest, and instalments should be repayable to small amounts. Care should be taken that the money given out is properly used by the recipients. It will be much better if *taccavi* loans are given through co-operative societies or the Co-operative Department.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(*a*) (i) The main causes of borrowing are:—

The cultivation of land does not pay. A man's income from land remains far below his labour. A cultivator can till an area of 12 acres with a yoke of bullocks and two men, whose labour is Rs. 365 × 4, that is, Rs.1,460, while his income from this area is round about Rs.500 at the most, in *barani* land, and double that in the canal irrigated lands. He has no hand in the market. While the fact is that the articles for disposal are actually his, the middlemen and the merchants are the sole masters of his crops. He is never paid the proper prices of his commodities. His grain is sold at low rates.

The advantages are drawn by the middlemen, and thus he does not get the proper prices. The harvest is always uncertain and irregular, and the zamindar on account of his ignorance does not and cannot make proper arangements. There is lack of co-operation among them, and because of this they have to incur great expenditure on small tracts of lands. In India, cultivation is restricted to ploughing and growing some particular crops. Sericulture and other branches are not adopted. Litigation is also one of the causes of borrowing. In *barani* areas, for a considerable part of his time, he remains idle. For these reasons his income is always less than his expenditure. Some people suggest marriage as one of the main causes, but I do not agree that this is the chief cause, as such cases are very rare.

(ii) Generally *sowcars* and *adatyas*. Now some help is being rendered by the co-operative societies.

(iii) The cause mentioned in (i), along with exorbitant rates of interest, compound interest and underpaying the price of the corn by the *sowcars*.

(*b*) Special measures should be taken to deal with rural insolvency. The application of the Usurious Loans Act must be enforced and facilities for redemption of mortgage must be provided.

(*c*) It should be done in the case when the other party is a non-cultivator.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(*b*) Ignorance and illiteracy are the causes, and by their removal these obstacles can be removed.

(*c*) Yes. It is necessary.

QUESTION 8.—IRRIGATION.—(*a*) (ii) and (iii) In some parts of the Gujrat and Kharian *tehsils* of the Gujrat district, schemes for providing tanks should be considered; streamlets or *nullahs* from the mountains that flow during the rainy season do much damage to the land and that water goes unused; in some parts wells should be dug.

In some parts of the Gujrat district, *nullahs*, and in some other, the unevenness of the land, are the obstacles in the way of irrigation.

(*b*) No methods have been employed to remove them, as far as I know. In a distributary the lands at low levels get more water than the required quantity, and the lands at higher levels get a less quantity. This evil can be removed if meters are fixed at lower levels to regulate the consumption. The second evil can be removed by putting a *thokar* before every *moga* (outlet) and by raising the level of the water so high that it will give an adequate quantity of water to places at higher levels. If the water is regulated according to this method, the complaints at the tail end must be removed.

QUESTION 10.—FERTILISERS.—(*a*) Yes, if the natural manure is well and methodically kept. It will give more yield; it can be spread over a greater area than at present, hence greater use can be profitably made of it, and, if artificial manure factories are started at important places of the district or at the headquarters of the district, those could also prove profitable, and such manure could be consumed in greater quantity.

(*b*) 1. Scientific experts should be appointed to supervise and examine the fertilisers, and they should certify that the fertilisers kept are pure.

2. The seller should provide a certificate to the purchaser, certifying therein that the fertilisers are pure, and if they turn out to be adulterated, the sellers be prosecuted.

(*c*) Demonstration should be done; prices should be moderate; railway freight should be 50 per cent. less.

(*f*) It can be done if zamindars could get fuel free of charge, which could be done in the following ways:—

Zamindars might have a hedge of kikar or some other trees round the border line of their lands. These trees should be pruned every year when they reached a sufficient height. They would serve both purposes, i.e., hedge and fuel.

QUESTION 11.—CROPS.—(*a*) (i) Considerable improvements have been made in the existing crops, and if the Agricultural Department and the seed farms continue their efforts it will prove beneficial to the zamindars.

(ii) American cotton has made rapid progress through the efforts of the Agricultural Department. Sugarcane, various cotton and some fodder crops are being tried as experiments by the said department.

(iii) The distribution of seed of every kind must be very widely adopted, as the present system has produced a healthy effect on agriculture.

(iv) In some Provinces, I understand, much damage is done by wild animals, and the prevention of this damage will prove very useful to agriculture. Free licences should be issued to the zamindars and *shikaris*.

QUESTION 12.—CULTIVATION.—(i) Tilling of the land with Meston, Raja, Hindustan and other such ploughs; and the introduction of harrows and drills, i.e., modern implements, will prove beneficial.

(ii) The best rotation, in my opinion, is wheat after cotton and *vice versa*. In this way, for the wheat, the land can be tilled for a full 8 months, and the dried leaves will serve as manure. Thus the tilled land will be under the sun for the whole of the hot weather. If the *zamindar* tills the land just after the cotton has been removed the land will have the benefit of exposure during a considerable portion of the cold weather.

The mixture of important crops is not recommended, but a mixture of fodder crops will be useful, i.e., *chari* and *moth*, *guar* and *chari*, *guar* and *bajra*. If we sow *senji* in cotton, it will not only be a good fodder for the cattle, but will also serve as manure to some extent.

QUESTION 13.—CROP PROTECTION.—(i) The existing measures are insufficient and inefficient.

QUESTION 14.—IMPLEMENTS.—(*a*) I cannot see how the old native implements can be improved. I think the introduction of modern implements and machinery for agriculture is essential.

(*b*) By demonstration, the cultivator can rapidly be persuaded to adopt these implements. The best and least expensive course would be that the Agricultural Department should depute men, trained in agriculture, who might work in the farms of those cultivators who have begun cultivating under the modern system. Others, on seeing this, will also soon adopt the use of modern implements.

(*c*) I do not think there are any difficulties for the manufacturer to overcome in regard to producing and distributing the implements. On the contrary, the Agricultural Department renders marked help by providing facilities for the sale of the implements and the recovery of the prices.

QUESTION 15.—VETERINARY.—(*a*) The Veterinary Department should be under the Director of Agriculture.

(*b*) (i) They are not really under the District Board, though it spends something on them.

(ii) In the Punjab, the Government is trying to meet the needs. If the effort is continued, the needs will be adequately met.

(*c*) (i) No. The remedy is that there be two Veterinary Assistants in one hospital. One of them should make extensive tours, well equipped with medicines, and the other should remain at the hospital. The touring officer should have only so much area as can be attended to regularly and early or the veterinary hospitals can be erected at a radius of five miles so that people can reach them easily and obtain the necessary help.

(ii) I have not seen any touring dispensaries in my district, and, if there is any, no result of its work has ever been apparent.

(*d*) People are becoming more inclined towards getting their animal treated; I, therefore, think there is no need of any legislation. The only thing needed is, that the veterinary aid be increased and that all facilities for the treatment of animals be provided.

Khan Bahadur Chaudhri Fazl Ali.

(*f*) Now inoculation is winning favour day by day. No fee is charged and must not be charged.

(*g*) Yes.

QUESTION 16.—ANIMAL HUSBANDRY.—(*a*) (i) Live stock can be improved if particular animals of particular breeds meant for particular purposes are kept separate and carefully looked after. People may be induced to adopt this policy. The mixture of the breeds spoils the animals and the zamindar can derive little benefit from them.

(*b*) (i) Overstocking of common pastures is often the cause of spreading contagion among the animals.

(iii) Insufficiency of dry fodder weakens the animals; as a result, not only do they work badly but they produce calves at long and irregular intervals, which is not good in any respect.

(iv) The absence of green fodder has the same effect on the animals as mentioned in (iii).

(v) This also has a bad effect in my opinion.

(*c*) From 15th December to 15th February, *i.e.*, from six to eight weeks; in three weeks after the monsoon has started they begin to thrive.

(*d*) *Bhusa* in the canal-irrigated tracts and *bajra* in the *barani* tracts should be well kept and properly stored; if different kinds of useful grasses are sown, and green *chari* is stored, the scarcity can be removed to a great extent.

(*e*) By education and impressing upon them the benefit of so doing, and by demonstration.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*a*) In the canal-irrigated areas the cultivator is seldom idle. In the *barani* tracts he is busy for nearly 245 days and does nothing for the remaining period. Besides, amongst the cultivators there are persons who are superfluous and are only nominal workers; in fact, their presence is not at all essential, hence it should be considered that there are people in the irrigated and *barani* areas whose whole time is vacant.

(*b*) By impressing on them the benefits of the adoption of subsidiary industry, by demonstration, and by providing means for such an industry, we can encourage them to adopt it.

(*c*) The obstacles are lack of education, absence of instructors, inability to get them easily, and paucity of funds.

(*d*) Yes.

(*e*) Yes, I think employment could be found without adopting any special method.

(*f*) Yes.

(*h*) This end can be obtained by impressing upon them the advantages of sanitation and general improvement of health, of which they are ignorant.

QUESTION 18.—AGRICULTURAL LABOUR.—(*a*) (i) Good remuneration.

(ii) Tenancy rights should be given and, if not this, then long lease.

(*c*) To give comfort and good wages.

QUESTION 19.—FORESTS.—(*b*) If the zamindars grew trees on the borders of their lands, they would serve the purposes of fire wood and hedges; also they should sow fodder crops according to their needs and store and use it in a methodical way.

(*c*) It must have led to soil erosion. The best remedy would be to grow more trees.

QUESTION 20.—MARKETING.—(*a*) In my opinion, the market facilities are the communications by railways and roads. In the Gujarat district, there are not sufficient railways and roads to the markets, *e.g.*, Jalalpur Jattan, Kunjah, Dinga, Pindi-Baha-ud-Din and Gujarat proper. Among these

Pindi-Baha-ud-Din is the biggest market in the district and is situated in the canal area. Here corn is imported in very big quantities. Roads are not sufficient in any of these places, and in some places there are very few; and where they exist, they are not of a quality which render any service.

(*b*) I am satisfied neither with the system of marketing nor with the system of distribution, particularly in the case of produce exported overseas. The zamindar brings his produce to the *adatya* who sells it to the merchant, and this merchant sells the corn, etc., in order to be exported overseas. The *adatya* takes the commission alone. The merchant who exports it very often moistens the cotton, and adds barley, dust, etc., to the wheat.

(*c*) I think that any person who sends any article to the markets, especially overseas, should note the quantity and grade of the corn, with his own name, on the bale. In this way, if the corn turns out to be bad, only the sender will be defamed and not the trade.

(*d*) Yes.

QUESTION 22.— CO-OPERATION.—(*a*) (i) The Government should grant more money for the advancement of different aspects of co-operation and for the pay, etc., of the Sub-Inspectors, so that propaganda work can be done to a greater extent; its need is badly felt.

(ii) The non-official agencies should pay more attention and give more time for the purpose, and pay more money to the banks as members of the societies and as their depositors.

(*b*) Credit societies require more money to meet the demands of the members. Loans be given for a term during which the zamindars can pay back the money with ease.

In my opinion, societies of every kind are working well. Societies of some kind have made a good start. If all the societies show signs of improvements achieved and keep on doing well, the country as a whole is bound to flourish and prosper.

(*c*) No.

(*d*) Yes, to a considerable extent.

QUESTION 23.—GENERAL EDUCATION.—(*a*) The present collegiate, middle and elementary education produces no effect on the agricultural efficiency of the people. The desirable thing would be, that in all the departments, *i.e.*, high middle and primary, education courses containing agricultural topics should be taught. Such courses should be prepared, in which agricultural topics are discussed in their diffierent aspects.

(*b*) (i) Agricultural education should be given along with other general education. In all the schools and colleges such provision should be made as would enable them to remain in touch with agriculture. There should be farms attached to them so that they can gain something of it by doing the work practically. There should be an agricultural teacher in every such institution for the purpose.

(ii) In rural areas, with the introduction of compulsory education the education of the people is increasing, and before long all the people will be taking advantage of it to its full extent.

(iii) The parents, being ignorant, are not fully aware of the benefits of education. Besides, the zamindars consider education as a means for securing service only. Further, their children begin taking part in agriculture at a very early age.

QUESTION 24.—ATTRACTING CAPITAL.—(*a*) The agriculturist capitalists may be induced to take up agriculture by demonstration and by impressing upon them the importance and utility of modern implements and other advanced methods of agriculture. Inducing the non-agriculturist capitalists

to take to agriculture will be of little benefit. They will invest their money only and all the work will be done by the zamindars. They will not treat agriculture as a profession, as they will have multifarious occupations of their own in which they feel keenly interested and which are much easier, nor will they think of its advancement, as it would not be their vocation, and will be dependent on others. Rather will they try to make money out of the efforts of the agriculturists. Naturally such capitalists will not become agriculturists themselves, but will treat agriculture as an extra source of income. At present, the non-agriculturist landholders are not working on their lands themselves, but the agriculturists are doing every work for them. These latter will become coolies, and consequently their interest in land will lapse, as the cultivators do not know any other art, and thus they will have to work under such capitalists. The result will be that instead of cultivators, a class of slaves will be produced. Besides, keeping the general condition of agriculture in view, much capital is not needed bly every cultivator. With small capital and much co-operation, the end can be achieved. Moreover, to encourage the capitalists to undertake some particular business, thus depriving the others of its benefits and putting them, as a class, at the mercy of the former, is against all the rules of co-operation. Hence inducing non-agriculturist capitalists to take up agriculture would mean discouraging a most hardworking, martial-spirited, useful and sincere but ignorant, people. By this action the country as a whole will not be profited, because the Indian cultivators, taken collectively, possess such a huge area of land that the land with non-agriculturist capitalists bears no proportion. Therefore the progress of this small portion cannot be considered as progress of agriculture.

(*b*) Ignorance and following of the old traditions are the two chief factors that discourage the zamindars from making improvements in the agriculture. Now, wherever they are gaining knowledge, they are making some improvements.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(*a*) Efforts should be made in the direction of sanitation and health in the villages. Midwives should be trained; baby centres should be appointed, as is being done by the Red Cross Society; *pucca* roads leading to the stations and main roads should be made; lectures on hygiene and sanitation should be given; magic lantern slides on agricultural topics, hygiene and sanitation should be shown, as is being arranged by the Co-operative Department. Village libraries should be opened (as is being considered by the Education Department) wherein such newspapers and books as mention things that have a direct connection with health, prosperity and agriculture should be provided. It would be well if such a paper were started by the Co-operative Department.

Different types of manly games should be introduced. In connection with this, the Government has issued instructions and rural community councils have been formed.

(*b*) Yes.

QUESTION 26.—STATISTICS.—(*a*) (i) A greater percentage of *khasras* should be checked by superior officers than are checked at present.

(ii) The land classifications, i.e., *chahi*, *barani*, *nahri*, and *sailabi* should each be sub-divided into five kinds, i.e., superior, inferior, middling, between middling and superior, and between middling and inferior. The area to be tested should not be in *marlas*. It should be in acres, at least.

(iv) The produce of various tracts of various zamindars should be observed in order to see how much it weighs and from how much area the yield has been obtained.

Oral Evidence.

(Through interpreter.)

46,497. *The Chairman*: Khan Bahadur Chaudhri Fazl Ali, you are President of the Gujrat Central Co-operative Bank?—Yes.

46,498. I think you are President of the District Board?—Yes.

46,499. Were you its first non-official President?—Yes.

46,500. Do you farm yourself?—Yes.

46,501. How many acres do you own?—I have seven squares in one place.

46,502. Do you farm that land yourself?—Yes, with my own men.

46,503. You have no tenants?—Not on those seven squares.

46,504. Have you other land which you let out to tenants?—Yes.

46,505. Are you satisfied with the propaganda which is being carried out by the Agricultural Department?—I have no serious criticisms to make of it, but it should be extended.

46,506. On page 835, you mention adult literacy certificates, and say that anyone who teaches an adult who acquires such a certificate should get a fixed remuneration without any conditions?—In my opinion there are difficulties in the present system. Sometimes the students are taught by day and sometimes in the evening, and zamindars are unoccupied at different times in the day.

46,507. It has been suggested to the Commission that in some cases these night classes for adults are not what they appear to be; that the attendance rolls are not correctly kept, and that in fact they are very largely a sham. What do you say to that?—There are not many examples of that kind, but it is true that zamindars and others often join these classes and leave them again after a short time.

46,508. What experience have you of better-farming societies?—I think they are doing useful work.

46,509. Do you think they might usefully be extended?—Yes.

46,510. On page 836, you give some figures of what a cultivator can till with a yoke of bullocks and two men, and you give figures for wages and an estimate of the income from this area. Is that based on your own experience?—Yes.

46,511. Are these figures typical of the district?—In my opinion they are. I have not shown all the expenditure, but only that on labour.

46,512. Have you experience of co-operative commission shops?—To some extent.

46,513. What do you think of them?—In my opinion they are very useful.

46,514. Do the *adatyas* in the markets here sometimes act as commission agents and sometimes purchase on their own behalf?—Yes.

46,515. Do you think it is in the interests of the cultivator that a man employed as a commission agent should himself purchase the commodity?—No.

46,516. Is it your view that the introduction and spread of co-operation in the Punjab has been a factor of great importance in the amelioration of the cultivator's position?—Yes.

46,517. Is there much criticism of the co-operative movement?—There may be some slight defects in it, but there is no serious criticism of it.

46,518. It has been suggested before the Commission that members of co-operative societies who for one reason or another wish to leave the

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movement are frightened to do so because of the existence of Government Sub-Inspectors and other officials in touch with the movement. Is that so?—That is entirely wrong.

46,519. There is no reason why a member should not retire from the movement if he wishes to do so, and no difficulty is placed in his way; is that the position?—Yes. Members join and leave as they like.

46,520. *Sir Thomas Middleton*: Have you any middle vernacular schools teaching agriculture in your district?—There are middle schools to which a teacher, trained at Lyallpur, has been attached to teach agriculture, but the agricultural teaching he gives can hardly be described as satisfactory; he does not put his heart into it. The teachers have not enough time, nor are they sufficiently trained to give proper agricultural instruction.

46,521. On page 836, you give an estimate of the cost of cultivation and the receipts therefrom. Will you let us have the details on which that estimate is based? These are the details we want; perhaps you will send them in to us in writing: wages of the men, cost of maintaining the bullocks, land revenue, other expenses, including any cess. On the other side: quantity of crop grown, price at which it is sold?—There is a difference between the cost of bullocks maintained by the farmer and the cost of hired bullocks.

Perhaps you will give both.

46,522. *Sir James MacKenna*: At present, District Engineers are appointed by the District Boards. Would you prefer to have a Service of District Engineers under the Minister of Local Self-Government, so that engineers could be posted to District Boards when they required them?—On condition that the District Board approves them and has the power to dismiss them, yes.

46,523. *Professor Gangulee*: On page 836, you say that improvements can be made by increasing the number of agricultural and veterinary staff, and you suggest that they should be controlled by the Co-operative Department and supervised by that department. You do not want them to be supervised by the Agricultural Department?—The Sub-Inspectors and Inspectors of the Co-operative Department have to go to the villages for propaganda work, and the Agricultural Department needs officers for propaganda work also. I suggest these co-operative officers should do that work for the Agricultural Department, and that, when an expert is required, they should send him. Different experts will be required in different places. If it had to do its own propaganda, the Agricultural Department would have to employ many such experts.

46,524. For how long have you been President of this bank?—For the last 16 or 17 years. I was first Secretary and then President.

46,525. You say that special measures should be taken to deal with rural insolvency. What measures are you thinking of?—Means should be devised so that zamindars can utilise their spare time. The Co-operative Department can help them there, and the Agricultural Department can teach them to do intensive cultivation. They should be persuaded to adopt modern machinery. At present, moreover, the zamindar does nothing but arable farming; he should be persuaded to take up poultry-farming, sheep-breeding and so on. It sometimes happens that a man cultivates only four or five acres of land, yet he has the expense of maintaining a pair of bullocks. People with holdings like that should be persuaded to join together; three such men might join together and keep a pair of bullocks between them.

46,526. What definite improvements have you noticed in the agricultural practices of your district?—Great improvements have been effected in regard to seed and the sowing of crops in lines.

46,527. Has anything been done in the use of fertilisers?—Very little.

46,528. What about improved implements?—A great deal has been done there.

46,529. These are the benefits the country has derived from the Agricultural Department?—Yes.

46,530. Is the agriculturist moneylender increasing in numbers?—Yes, among Sikhs and Hindus, but not Mahommedans.

46,531. *Mr. Calvert*: You have a demonstration farm in Gujrat?—Yes.

46,532. How is it going on?—It has not done very well, because the land is poor.

46,533. Who is in charge of it?—It was at one time under the District Board, but now it has been taken over by the Department of Agriculture.

46,534. Have you seen the better-farming society at Chillianwala, which is in your district?—Yes.

46,535. What kind of work is that doing?—Good, so far as farming is concerned, but they have not taken up the question of small industries which might be adopted by the cultivator. So far as that is concerned, even the Government demonstration farm is not being run on the right lines.

46,536. For encouraging better farming among zamindars, which is the better system; more demonstration farms or more better-farming societies?—The latter.

46,537. You say the cultivation of land is not paying. If that is so, why do the zamindars want to buy more and more land?—It is a question I have often asked myself; I think it must be because agriculture is their profession and they must follow it.

46,538. Then why do non-agriculturists want to buy land?—At first they took it in payment of debt; now those moneylenders who have surplus money and no investments for it put it in land; but I think they are making a mistake.

46,539. Have the co-operative societies in Gujrat had any effect on the moneylender?—I think they have, because the zamindar can get money enough from the societies.

46,540. You say the present collegiate, middle and elementary education produces no effect on the agricultural efficiency of the people. Are you not the founder of the Zamindar High School in Gujrat?—Yes.

46,541. Has that no effect on the agricultural efficiency of the people?—We have a teacher of agriculture there who is an expert.

46,542. And you think that is doing good work?—Not so much as I would like, but it is doing some good.

46,543. Has anything been done in Gujrat for the consolidation of holdings?—Something was done, but the work has been stopped now.

46,544. What is your opinion of the consolidation of holdings?—It is very good work .

46,545. Do you think the zamindars in Gujrat would now be ready to accept compulsory consolidation?—In my opinion propaganda is needed rather than compulsion, and for that it is necessary to employ men who belong to the district and know the local conditions.

46,546. Do you think there is too much official interference in the co-operative movement in Gujrat?—Not in my opinion.

46,547. *Mr. Kamat*: As the non-official President of your District Board, will you please tell me what are the obstacles in the way of the improvement of roads?—Want of funds is the chief obstacle.

Khan Bahadur Chaudhri Fazl Ali.

46,548. What remedies can you suggest? How can you improve the roads?—The District Boards should get bigger grants for roads.

46,549. *Professor Gangulee*: You have a road cess?—No.

46,550. *Mr. Kamat*: Is there any marked difference in the state of the roads where there are official Presidents and where there are non-official Presidents?—It is very difficult to say, because the system of non-official Presidents was only started a year ago. In my district the official, Presidents took a great deal of interest in the improvement of roads, but about six months before I took over the chairmanship the condition of the roads was very poor.

46,551. Since 1921, since the Reforms I mean, has there been any marked change for the worse in the condition of the roads?—In my district, they have been poor for many years, but during the last two years they have improved.

46,552. And there was an official President until about six months ago?—Yes.

46,553. *Sir Ganga Ram*: On page 836, you say the railways do not pass through the areas which require them most. Have you any list of those railways?—I can speak with some certainty of my own district. The present line passes along the Jhelum river and does not serve the proper colony.

46,554. Do you recommend new feeder lines?—In our district a proposal for a line is pending, but the route the railway people want it to follow is quite wrong.

46,555. Will you send a note to us on that point?—Yes.*

46,556. A large amount of money has been given to the Gujrat district by the Communications Board. Have you not utilised it properly?—We have utilised everything, but we were not given very much.

46,557. You are quite satisfied with your District Engineer?—Yes.

(The witness withdrew.)

Mr. TREVOR TROUGHT, M.A., Cotton Research Botanist, Lyallpur.

Replies to the Questionnaire.

Introductory.—I arrived in India at the end of August, 1925. My previous experience was in Egypt, where I was working under the ægis of the Cotton Research Board from 1919 to 1925.

As I have been in this country so short a time, my views are more those of an outside critic than of one who has an intimate knowledge of the organisation and administration of the Agricultural Department.

QUESTION 1.—RESEARCH.—(*a*) (i) For the purpose of this reply, I propose to limit consideration to two types of research only.

By limiting the scope of pure research to the sphere of agriculture, a type of research is obtained which broadens the foundations of knowledge upon which a structure of economic importance can eventually be based, and which has been termed "fundamental research." Without information obtained from this kind of study for the soils, crops, and environment which form the "agriculture" of a district or Province, it is difficult to see how the practice of agriculture can be improved except empirically by trial and error. Without a complete knowledge of the life history of an insect pest, for example, the entomologist is not in a position to recommend, from first principles, the best methods of control.

* Not received.

The second type of research concerns the translation into practice of this fundamental research. It includes also the explanation in scientific terms of established practice. Plant breeding, for example, is, in essence, the application to a particular crop of the fundamental researches of Johannsen and Mendel. As this research has a definite aim, namely, the direct improvement of the economic outturn to the cultivator, research into plant diseases and pests and methods of control must also find a place therein. It is scarcely possible to exclude research for the betterment of technique. Though this last type of research is strictly speaking in a different category from the two mentioned above, it can conveniently be included in the second type of applied research, as the individual engaged in the application of new knowledge must also concern himself with the technique.

I do not propose to emphasise the value of research. Mr. Milne's work on cotton is an outstanding example of the value of crop improvement work. An increase due to research of only one rupee per acre for the wheat crop of the Punjab would mean over 90,00,000 rupees per annum increased wealth to the Province. I may also quote the report of the Research Sub-Committee to the recent Imperial Conference (Nature, December 4, 1926, page 795): "Money devoted to research is not a luxury; it is rather a condition of survival, without which the Empire cannot hope to keep abreast of its competitors in the economic field."

The general expansion in research throughout the world means that a similar expansion in India must be anticipated.

If the Central Government is to co-operate with other Governments in establishing a chain of research stations throughout the Empire, a decision must first be made as to the subjects and localities in which such stations or bureaux are to be established in India.

It is clearly desirable also that there should be co-operation between the Central Government and Provincial Governments in any scheme for expansion. Fundamental research in certain lines should be of value to the whole of India, and in consequence should be financed wholly or in part from Central Revenues. Control measures arising from this type of research may have to be applied to the whole of India, and it is natural to expect that the Central Government would wish to retain control in such cases. For example, the milk supply and the control of tuberculosis in cattle may be cited as subjects which could best be dealt with by the Central Government. As it would be necessary to refer to Provincial Governments before any final decisions could be made, it seems that the first step in the actual organisation of expansion must come from the Provincial Governments.

It is suggested that a survey of the possibilities could be undertaken by a committee set up by the Provincial Government. The Committee should be composed of men representing the different branches of science and acquainted with local conditions, representatives of Agriculture, Veterinary Science, Irrigation, and Commerce or Economics and presided over by an administrator.

Such a committee would be entrusted with drawing up a report showing—

(1) The most suitable centres for Research Institutes in the Province.
(2) The broad lines of research to be undertaken.
(3) Suggestions for the division of effort between the Central and Provincial Governments.
(4) The organisation and staff required for the Institutes.
(5) The type and extent of buildings required.

1. *The most suitable centres for Research Institutes in the Province.*—Each tract showing marked general differences in the type of Agriculture, whether due to soil or climate, irrigated or *barani*, should have its own research centre. For example, the Punjab should have at least four such stations, viz., one for the Jhelum and Chenab Canal Colonies, one for the sub-montane tract, one for the eastern and south-eastern area (which is similar to the

adjacent portions of the United Provinces) and one for the drier Lower Bari Doab Canal Colony with the Multan and Muzaffargarh Districts and the new Nili Bar reclamation scheme.

The question of co-operation with adjacent provinces can suitably be considered under this heading.

2. *The broad lines of research to be undertaken.*—These should be tabulated under the different sciences. It is not advisable to restrict the workers concerned to too narrow a programme.

3. *Suggestions for the division of effort between the Central and Provincial Governments.*—The distinction between the two types of research should be borne in mind. In drawing up this part of the report, the Central Government could be invited to depute a member of the Imperial Department's Headquarters to assist in the discussion. No hard and fast line can be demarcated, however, as at times the Central Government would expect to assist temporarily in the elucidation of one particular problem, either by financial assistance or by the loan of staff; and for other investigations the assistance would be more permanent, and would be considered as part of the Central Government Scheme.

4. *The organisation and staff required for the Institutes.*—An important point in organisation is that research workers should be as free as possible from unnecessary routine. A difficulty with all research under a Government is that the workers tend to become forced into the administrative machine to the detriment of their research work.

The financing and administration of the Institutes could probably be left in the hands of a specially appointed Research Board; the Government would create a Trust Fund, which the Research Board would administer. (As a parallel example may quoted the Natural History Museum in South Kensington, which is financed by Government but entirely administered by Trustees).

The functions of a Research Board (which would be essentially the same in composition as the committee reporting on the methods of expansion, with the addition of a permanent Secretary) in addition to managing the Trust Fund would include responsibility for "vetting" programmes of work, co-ordinating research at the different institutes; and expressing technical opinions on matters relating to agriculture and its connected industries referred to them by Government.

Each institute should be provided with a Technical Secretary and an Administrative Secretary, and their duties defined. For example, the Technical Secretary would deal with the preparation and publication of reports and bulletins, the library, collection of information, purchase of apparatus, new projects, etc., while the Administrative Secretary would be responsible for pay and allowances, leave, stores, maintenance and repair of buildings, etc.

The size of the staff allotted to each Institute depends on more than one factor; but the original schemes should provide for a full staff, even though it may not be possible or advisable to complete the staff immediately.

No expansion in research can be undertaken without considering what personnel is available to do the research. There is a shortage of highly trained scientific workers and—to quote again the Report to the Research Sub-Committee of the Imperial Conference—this shortage is attributed to "the inadequate appreciation of the importance and value of scientific research on the part of the public, of the Press, and even of Governments themselves, the uncertainty in the minds of men embarking on a university course as to the amount, interest, and continuity of the employment which will be available in their branch of science when they have completed their studies."

The publication of a comprehensive scheme of expansion would tend to remedy this shortage in due course. I would emphasise the importance of obtaining suitable men. It would be better to let a post rest vacant than appoint an unsuitable man.

5. *The type and extent of buildings required.*—The buildings similarly should be adequate and permit of expansion. Extra accommodation for research students and for attached officer, above the needs of a full staff must be allowed for. As an example of the rapidity with which expansion becomes necessary, the Cotton Research Board Laboratories at Giza may be quoted. These laboratories were completed in 1920. Another storey was added in 1926. The original designs were drawn up to allow of this upward expansion.

It will be understood that in advocating a greatly increased activity in scientific research in the future, no reflection is being cast on the adequacy of the provision for research in the past. His Highness the Prince of Wales paid a high tribute to the Indian Empire in this respect in his address to the British Association last July. With the greatly augmented rate of advance in scientific progress during the last ten years, it is, however, necessary that India, to maintain her position, must also advance rapidly.

(*c*) With the opening up of the Nili Bar, there appears to be an opportunity of studying the succession of the bacterial flora and protozoal fauna in the soil under different rotations, starting in each case from the virgin soil.

Question 11.—(*a*) (*i*) *Improvement of crops.*—I attach a paper, published in the Agricultural Journal of India, July, 1926, on the "Improvement of the Cotton Plant."*

Systematic work on these lines on all crop plants is necessary as further improvement can always be obtained. Botanical work for the improvement of crop plants would form an essential part of the programme for the Research Institutes advocated in my reply to Question 1. I am convinced of the necessity of obtaining local races for individual districts.

Supplementary Note on Punjab American Cotton, by Mr. Trevor Trought, M.A., Cotton Research Botanist, Lyallpur.

The main Punjab American variety is 4F. 289F is grown commercially in the Lower Bari doab colony, and has proved satisfactory.

4F is a moderately early, good yielding cotton with a mean fibre length of ·81 inch.

289F is later, a heavy yielder and a mean fibre length of 1·01 inches.

Both these cottons are a tremendous advance, but it is not pretended that it is impossible to improve upon them.

4F is probably not entirely suitable for the Lancashire market, though 289F compares favourably with Middling American.

4F also suffers from the disadvantage that in a bad year climatically it seems to suffer fairly easily, giving poor yields.

Improvements can always be expected in lint lengths, yield, &c.

These improvements may hopefully be expected to arise in the ordinary course of plant-breeding work, either from single plant selections, from hybridisation or acclimitisation.

The 4F crop, in my experience, is, considering the number of years since it was first introduced, surprisingly pure.

There is evidence, however, that it is now undergoing deterioration.

The main reason for this deterioration is natural cross-fertilisation in the field from some impure plant and the continued renewal of the seed supply from this crop.

* Not printed.

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Secondly, mechanical admixture of seed accounts for much deterioration. There is no ground whatever to suppose that a commercial crop need deteriorate if precautions are taken to prevent the above two causes from operating.

The States Domains Sakel in Egypt and the Pima Cotton of Arizona are examples where crops have been grown for ten or twelve years, and the present crop is even better and more pure than when it started.

It is a difficult and slow process to eradicate deterioration once it has appeared in a crop.

"Negative bulk selection," or the reverse process, "Positive bulk selection," may be employed, but are somewhat uncertain in their results.

In general, the quickest, safest method is to start with the genetically pure, single plant and propagate it into bulk, taking all the precautions possible to prevent admixture and maintain purity.

This implies a well-organised seed supply scheme, of which the central cotton-breeding station is the pivot.

Diagrammatically expressed, the sequence would be:—

(*a*) Single plant.
(*b*) Pure line family.
(*c*) Increase plot
(*d*) Increase plot.
(*e*) Seed farm.
(*f*) Seed farm.
(*g*) Large cultivator.
(*h*) Large cultivator.
(*j*) General public.

The essence of the scheme is that there shall be no return of seed, i.e., that (*g*) only obtains his seed from (*f*), and so on.

This scheme necessitates control of ginning, particularly in the early stages. Departmental gins, under direct control, would be necessary up to stage (*f*).

It is quite certain that commercial ginners could be found who were sufficiently interested in the supply of pure seed to allow of cleaning of gins, and suitable supervision in stages (*g*) and (*h*).

Oral Examination.

45,558. *The Chairman*: Mr. Trought, you are Cotton Research Botanist at Lyallpur?—Yes.

46,559. We have your note of evidence. Is there anything you wish to add at this stage?—No.

46,560. Will you give the Commission a short account of your own training and past appointments?—I graduated from Cambridge in 1913 and held a Development Research Scholarship from then until the beginning of the War. After the War, I was appointed a Senior Botanist in the Ministry of Agriculture in Egypt; that was in 1919. I resigned in 1925 and came to this post in Lyallpur.

46,561. Is there anything in the structure of the research organisation in Egypt which you think might usefully be put before the Commission, as being applicable to India?—Cotton being the most important crop in Egypt, the research had mainly to do with cotton, and there was a large team of workers engaged on cotton research. They were all housed in one building, which was very convenient from the point of view of administration and also for liaison work between different branches of science.

46,562. Have you formed any view yet as to the value of the type of organisation represented by the Indian Central Cotton Committee?—I am

a servant of the Indian Central Cotton Committee, and therefore naturally consider it is doing very good work indeed.

46,563. Do you think that particular type of organisation, viz., organisation by crops, is one which is well suited to conditions in this country?—From the point of view of a particular crop, I think that type of organisation is suitable.

46,564. That committee knows no territorial limits in its work?—No.

46,565. What proportion of the area under American cotton in the Punjab is under 4F?—In 1924-5 there were 980,000 acres under 4F, and that has been increased in the last two seasons.

46,566. So that the bulk of the area under American cotton is under 4F?—Yes. The other type is only a small crop at present.

46,567. The market value of 4F is therefore of very great importance to the Punjab?—Yes.

46,568. On page 849 of your supplementary note, you eliminate altogether the notion that a particular variety need necessarily deteriorate provided precautions are taken to prevent cross-fertilisation?—And mechanical admixture.

46,569. You do not hold with the theory that hybrids inevitably begin to lose their vigour after a time, however pure the seed may be kept?—A pure crop would not lose its vigour. There is no scientific reason for supposing it would.

46,570. Then there is no reason why 4F, if those two conditions are complied with, should lose its quality or its vigour?—No.

46,571. But you say on page 848 there is evidence that 4F is undergoing deterioration?—Yes.

46,572. Has that proceeded to a point where the commercial value of the crop is beginning to decline?—I do not think it has gone as far as that yet. The evidence I have is not very abundant, but I think it is fairly certain. It is based on the character of the seed, which, in the first place, I believe was a naked seed, whereas now in a sample of 4F you find variations in the fuzziness which are rather more than the normal variation one would expect. You get variation in halo length; for example, the range of variation in 4F halo lengths is about 40 per cent., whereas in a pure line of 4F it is only 20 per cent. You can pick out of a crop of 4F plants which have a halo length of only 17 mm. or 18 mm., though that is not common yet.

46,573. When you say you do not think deterioration has proceeded to the point of serious commercial deterioration, do you know the views of the trade at the great cotton centres to which the cotton of the Punjab finds its way?—I cannot say I do as yet. I hear a certain amount of gossip from friends in the cotton trade, but I have never taken an official opinion, as it were, on that point.

46,574. What does the gossip amount to?—They say it is deteriorating, but I think that is the kind of thing people in the trade always do say.

46,575. You do not take that very seriously?—No.

46,576. You describe, on page 849 of your supplementary note, the manner in which, from a single plant, a particular variety is distributed to large cultivators and then to the general public, and you also mention means by which it is possible to recover ground that has been lost by reason of cross-fertilisation and mechanical mixture of seeds. Is there any reason why, assuming that 4F is a really good cotton, but has reached a stage where deterioration has begun to appear, the whole process which you describe as being suitable for a new variety should not be repeated with 4F, giving it, perhaps, another name?—I consider that is the quickest and safest method of replacing a deteriorated 4F with a pure 4F.

Mr. Trevor Trought.

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46,577. Would the absence of any distinguishing mark between the new 4F and the old 4F be a difficulty?—Not if the supervision is complete. There should be no difficulty whatever with this scheme; you could actually call the new 4F by another name, to make it popular more quickly.

46,578. What is the difference between negative bulk selection and positive bulk selection?—Negative bulk selection is the elimination by roguing of the worst plants, whereas positive bulk selection is the selection of the better plants in a crop for propagation.

46,579. *Professor Gangulee*: Do you follow both processes in your work?—I do not use positive bulk selection.

46,580. *Sir Ganga Ram*: Which process do you recommend?—Neither as the best means to the end, but as a means of carrying on while preparing a new variety I recommend negative bulk selection.

46,581. *The Chairman*: How many years would it take to get to the general public again with a new 4F, using the ordinary machinery for multiplication and distribution described on page 849?—In seven years you could sow half the area in the Punjab with the new variety.

46,582. Whether that was the new 4F or a different variety?—Yes.

46,583. Do you think it likely that 4F will give way to some more efficient variety in the near future?—I do not think you can stop the march of progress. I am hoping that it will. That is my job.

46,584. But in spite of the possibility of some new variety taking its place, you would recommend that an attempt should be made forthwith to redistribute 4F in a pure form?—I am doing that now.

46,585. What stage have you reached?—I grew one lot of pure line families last year, and I have now got to stage B in the scheme. I am doing negative bulk selection on areas in the Lower Bari Doab Colony.

46,586. Will that provide you with reasonably pure seed?—It should do so.

46,587. *Sir James MacKenna*: With reference to the alleged deterioration of 4F, have tests at the technological laboratory proved this deterioration to exist?—Not that I am aware of.

46,588. Have tests been made at your request?—No.

46,589. Do you think that might be a good thing to do?—The only series of spinning tests which have been carried out over a series of years were on the effect of climate on lint, but that would show at the same time any deterioration in 4F.

46,590. Deterioration due to natural cross-fertilisation comes in, I suppose, with inferior types of 4F, does it not?—Yes.

46,591. What, generally speaking, is the line of attack you are making on the problem in the Punjab? What is your general campaign going to be? You are going to do your best for 4F to begin with?—I am trying to purify the commercial crops and select new varieties for propagation.

46,592. *Professor Gangulee*: Is your work chiefly confined to hybridisation or selection?—Chiefly selection. Until you have your pure line, hybridisation is out of the question.

46,593. How do you co-ordinate your work with that of other stations maintained by the Indian Central Cotton Committee?—So far there has been no co-ordination. I have visited the Bombay research station at Surat, and I am hoping to go down to Madras next cold weather.

46,594. At the present time there is no co-ordination between the various research stations maintained by the Indian Central Cotton Committee?—I think there must be by the Cotton Committee itself, as they have all

the facts and figures at their fingers' ends, but I have not got into touch with that side of the work

46,595. The Indian Central Cotton Committee maintains a number of research stations throughout the country. Are all these research stations properly co-ordinated, and, if so, what is the organisation they have for the purpose?—I do not think I am in a position to answer that question; I am not sufficiently familiar with the organisation of the other parts of the Cotton Committee's work.

46,596. When you undertake any item of research, do you have to submit a scheme to any committee or council?—I submit an annual programme of work to my Director for approval.

46,597. And you have to submit a report on it at the end of the year?—A progress report at the end of the year, yes.

46,598. *Mr. Calvert*: Does this American cotton suffer from what is commonly mistaken for frost?—I cannot say, as my experience has been limited to one year, and we had late frosts that year. Naturally, heavy frosts would affect cotton.

46,599. We have been told there is really no such thing as frost in the Punjab, and that what really happens is radiation, and that the evil effect of radiation can be remedied by burning smoke fires. Do you think that is a practical proposition?—That would require thinking out. It depends on the number of days' frost you are likely to have in the year. It is going to be worth while if there are only two or three days' frost, but you could not keep a smoke screen going for two or three months. Considering the area under cotton in the Punjab it would be rather unpleasant.

46,600. Do you think the Meteorological Department could help more by giving early warning of oncoming attacks of radiation?—If they are able to do that it would undoubtedly assist.

46,601. Actually you receive their forecasts several days after it has happened?—What I receive is the data for the previous 24 hours. I do not think there is much forecasting done, except for large areas, in that bulletin.

46,602. Do you think the Meteorological Department could assist the cultivator of cotton on this question of damage from radiation?—I doubt it very much.

46,603. *Mr. Roberts*: With regard to the spread of a new variety, starting with 10 acres, I think you would get enough seed for 400 acres, or 40 times the amount?—Yes.

46,604. On good land you could spread 10 acres over 400 the first year, 16,000 the second, 640,000 the third and so? That is possible?—Yes.

46,605. In order to decrease the time required to get a new variety or selection on the market, attention is required in the early stages of multiplying?—Yes. Up to 10 acres takes longer than the later stages.

46,606. Do you regard the 4F pure seed as a clean seed?—The information I had is to that effect.*

46,607. Personally I consider the fuzzy seed typical also; I never considered the clean seed of 4F as being necessarily typical. We have always had a mixture of fuzziness?—I was not aware of that, but the information I managed to obtain was that it started in the first stage as clean seed.* There was possibly a little fuzz at the apex, but that was all.

* Note by witness: Mr. Milne in his evidence before the Indian Cotton Committee says that "practically all the 4F seed was black and almost naked" when he handed it over.

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46,608. If there was a considerable mixture, would you regard it as not being pure?—Botanically it could not be pure, but it might be that the seed character would have no effect on the lint.

46,609. Do you know roughly the present proportion between clean and fuzzy seed?—No, but from my recollection of seed samples I should say about half and half.

46,610. If it started as a clean seed and is now half and half there has certainly been a big change You have no evidence to prove there has been a change?—No.

46,611. You can give us no definite information on this point?—No.

46,612. As regards deterioration, you have probably heard that, in 1921, there was a great cry about this owing to the partial failure of the crops. Do you not think the cry just now is partly of the same kind, namely that the crop has failed and naturally the people think that it is due to the deterioration?—That is possible.

46,613. *Sir Ganga Ram*: Are there many varieties of Egyptian cotton grown in Egypt?—There are several varieties.

46,614. Are any of them suited for India?—The experiments I have tried show that they are not suited. There is a possibility that long staple Egyptian cotton could be grown in Mysore, but there you have the water difficulty; the water comes at the wrong time. If they could get irrigation, they might be able to grow Egyptian cotton in Mysore.

46,615. Has any trial been made in Sind?—Yes, it has been tried in Sind.

46,616. Has it proved successful?—I do not know; I think it has failed; I have not got the records.

46,617. What is the reason for its failure? Was it due to want of water or to the climate?—Judging from the Egyptian cotton in the Punjab, here at Lyallpur, and the similarity between the climate of Sind and the Punjab in the summer, I should say that it is the heat that is the cause, as the Egyptian plant is too delicate to stand the extreme heat of the Sind and of the Punjab.

46,618. The Sind heat is about the same as the Punjab heat, is it not?—I am told that it is worse.

46,619. You do not see any future for growing Egyptian cotton in Sind?—Not in its present form.

46,620. What do you mean by that?—I mean not with the present type of Egyptian cotton.

46,621. Would some new type have to be evolved?—Yes, it would have to be produced from the Egyptian cotton.

46,622. Would you change the time of sowing with that new type of cotton?—I know nothing about Sind.

46,623. Egyptian cotton is sown in February in Egypt?—In Upper Egypt they sow in February and the time of sowing gets later as you go further north. In the North of the Delta, they sow at the beginning of April.

46,624. *Sir Henry Lawrence*: Have you seen the records of the experiments which were made by Mr. Fletcher in Sind about twenty years ago?—No.

46,625. Are any experiments being made with Egyptian cotton now in the Punjab?—I have some pure lines growing which I brought from Egypt and I handed over half the seed to the cotton breeder in Sind; I heard from him that they all failed.

46,626. Perhaps you might examine the reasons why Egyptian cotton was given up in Sind? It was connected with the failure of the canal to supply water at the time of sowing?—That, of course, would account for the failure.

46,627. *Sir Ganga Ram*: Are you aware of the fact that 4F requires an immense amount of water in the month of September when there is more or less a scarcity of water because of the demand for water for other crops?—Yes; not an immense amount, but it requires ordinary watering in September.

46,628. Not even double or treble? My experience is that, in the month of September, if you give double the amount of water, you get double the yield?—I will make a note of that.

46,629. Is it a fact that the last failure of 4F was due to want of water, or to diverse wants as the Agricultural Department seem to make out?—The climatic factors and possibly the lack of water at a critical time combined with other factors about which I am not in a position to make any definite statement at the moment, will have conspired to produce the failure last year.

46,630. Are you aware of the fact that 289 in one year gives a good yield whereas in another year it gives a bad yield? It has been tried for the last three years?—Yes.

46,631. Is there any peculiarity about the water with regard to that?—Not that I am aware of.

46,632. Can it be expected to go on giving a good yield every year?—Under uniform conditions it can.

46,633. *Sir Thomas Middleton*: You recomended negative bulk selection because, I presume, it is so much easier?—That was the reason; it is easier to train Assistants in negative than in positive bulk selection.

46,634. Reference is made to co-ordination of your work with that of others working on the problem in India. You are no doubt familiar with what has been published by these workers?—Yes.

46,635. To what extent do the *deshi* cottons cross in the Punjab? Has any percentage of natural crosses been ascertained?—I do not think so, but they certainly do cross freely amongst themselves.

46,636. Has any figure been ascertained for the crossing of 4F American cotton?—No, as far as I am aware no figure has been obtained but I should imagine that it is on the same general run as other cottons, about 5 to 10 per cent.

46,637. I got similar figures in other parts of India and I want to know if you generally expected to get crossing to the extent of about 5 or 10 per cent.?—Yes, that is so.

46,638. In these Egyptian farms which have been carrying on over a number of years and where the cottons have maintained or improved their quality, are there stock seed farms associated with the estates?—The particular State Domains is a Government show entirely.

46,639. And there stock seed is produced for use?—Yes. They actually do positive bulk selection on their crop.

46,640. In your memorandum, you have distinguished between pure and economic research. Would you or would you not agree that it is easy to separate these ideas on paper, but very difficult to distinguish between them in practice?—Naturally one never knows to what economic purpose any pure research is going to be put.

46,641. That is so; but looking at it from the other point of view, at any stage an investigator who is engaged in producing, let us say, a

new and improved plant, may find himself up against a problem which is fundamental, and unless he is prepared to tackle it, his economic work comes to an end?—Quite.

46,642. You cannot group workers into rigid classes of those working on pure research and those working solely on economic problems?—I thought they were trying to do that at Home.

46,643. They are trying to avoid it, rather. We have been so much up against this difficulty in nomenclature that we talk about "free" research and "directed" research, directed that is to specific problems. The work in which you are engaged is directed to a specific problem, but at any moment you may be up against questions which are fundamental and require further research?—In that case, I shall have to ask for assistance.

46,644. It seems to me that your idea was that these pure research questions might possibly be concentrated in some institution run by the Government of India, and that a worker employed upon an economic problem when he found himself up against a difficulty would ask someone else to work it out for him?—He would join the central institution then.

46,645. You cannot lay down any rigid rule which would require the worker in a provincial institution, assuming he were to remain there, to confine himself entirely to directed research. What would have happened, for instance, to plant breeding work at Cambridge if there had been a direction that nothing but the production of particular types of wheat or particular types of crucifers must be attempted?—I quite see your point.

46,646. So that we may use this distinction between the two types of research for the purpose of clearing our ideas on paper, in practice we must have machinery which will make it certain that workers employed on economic researches are not narrowly restricted in the fields of inquiry which they must undertake?—My idea was that the directed research would be for a particular locality. It would not be suitable, for example, to try and produce a cotton for Sind in Surat.

46,647. Quite?—And from that point of view you would have your research limited and you would have to have it localised under particular conditions.

46,648. But, even in that case, you might come up against a fundamental problem which could not be attacked in a central institution or at least so profitably attacked in a central institution as locally?—The men of the local research institute would probably have to put aside a problem like that to carry on the routine work and get in a man from a central institution to assist. There could be a delegation from a central body to a provincial institution

46,649. You recognise that it would be of very great assistance to provincial research work if it were possible to get experts in for particular problems from some other institution in India or at Home?—I think so.

46,650. *Sir Ganga Ram*: Have you any experience of tree cotton?—I have seen it growing.

46,651. Where?—In Egypt where we had one or two experimental plants of tree cotton.

46,652. Have you seen it anywhere in India?—No.

46,653. In Southern India they grow it?—I have never been there.

46,654. Has it not come before your Central Cotton Research Committee?—If you are referring to *Bombax*, it has not.

46,655. No, tree cotton which is called as such in Southern India? I have had it in my village here, but the frost killed it off, and so I had to cut it away.

46,656. *Sir Henry Lawrence*: Is it worth any experiment?—I hardly think so; at any rate, not up in the Punjab, on account of the fact that the winter is severe here. You can keep it going on for two or three years, but it is always liable to get killed off at any time.

(The witness withdrew.)

Mr. MOHAMMAD AFZAL HUSSAIN, M.Sc. (Pb.), M.A. (Cantab.), I.A.S., Entomologist to the Punjab Government.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(*a*) (i) For a genuine criticism of the organisation, administration and financing of an Agricultural Department, I cannot do better than bring to the notice of the Royal Commission the report of Mr. S. M. Jacob, for the year ending June, 1922, which he wrote as the Director of Agriculture, Punjab.

Although great achievements have been made, yet it must be conceded that the progress of Agricultural Research has been slow.

The main causes of this unsatisfactory progress have been:—

(1) *Absence of a definite policy.*—Work in numerous directions has gone on without any preconceived plan, and, although useful results have been obtained, a great deal of money has been spent on problems of very remote interest to the cultivator. Intensive thinking has been absent and no well-thought-out plan of work has been laid down. Annual programmes and annual reports are published, but it is doubtful if an enquiry is ever held to find out how much has been actually accomplished. A thorough analysis of the problems is desired and a definite plan of action is necessary before real progress can be made.

(2) *Inadequate staff.*—Staff for research has been inadequate and in many cases inefficient.

(3) *Want of continuity.*—It has not always been the need of the country, but inclinations of experts which have been the deciding factors on lines of research. In some cases, hobbies decidedly outside the scope of the work of an expert have been indulged in at the expense of more useful work.

(4) *Lack of co-ordination among experts of the same institution.*—Problems of agriculture are often so complicated that it is necessary for a number of experts to be closely associated in an investigation. But in this country there is no co-ordination among workers. At two of the institutions where I have had the opportunity of working, each expert carries on according to his own lights and independently of other workers.

(5) *Lack of co-ordination and co-operation between officers on District work and research officers.*—The officers on district work and the research workers are never brought together for discussing the programme of work of the department. It is rarely that one receives any suggestion or information from the district. The two branches of the department go on working independently.

(6) *Lack of co-ordination between work done by experts under the Government of India and experts under the Provincial Governments.*—One knows of the work of experts at Pusa and in the Provinces from printed reports, and in Entomology there is mutual exchange of monthly reports between Pusa and Lyallpur. No effort is, however, made to co-ordinate work.

(7) *Administrative work for experts.*—The most serious defect of the present organisation of the research institutes is the combination of administration with research. A Head of a section at Pusa or at a

Provincial Agricultural Institute is saddled with a considerable amount of routine office work, e.g., signing travelling allowance bill of the assistants, making indents for apparatus and stores, answering enquiries, making reports to Government, preparing schemes of extension, showing distinguished visitors round, making plans for propaganda, and so on and so forth. This work probably takes away about 50 per cent. of his time and very often so dislocates his scientific work that actual time for original investigations is further reduced. And a Head of a section is supposed to undertake original research, guide the research of a large number of Assistants and take part in teaching and training of students. Naturally he cannot do all this. It is essential for progress in research that the administrative work is reduced to minimum for the Scientific Experts, so that they are able to concentrate on the problems before them and devote most of their time towards research. In my opinion this can best be done by the appointment of an officer under each expert whose duty should be to deal with all routine matters and the Heads of the Agricultural Departments should send as little work as possible to the experts. Wherever research and administration have been coupled together, research—which is the more taxing of the two—has suffered. Dr. Tillayard lecturing before the Royal Society of Arts said, "The progress that will be made in countries such as Australia and New Zealand seems to me to depend in a great measure on the recognition of the principle which has been put to work so successfully in England, viz., *the complete separation of research from administrative work.*"

(8) *Absence of research atmosphere.*—Another serious drawback in our Agricultural Research Institutions is the absence of research atmosphere. There are many reasons for this, the most important of which is officialdom. The person responsible for guiding research is an "Officer" whose status in life is different from that of his Assistants, and there is a wide gulf, social and official, between the two. I wonder if there exists in India a Government Research Institute where afternoon teas, so conspicuous a feature of British laboratories, attract all workers, "big" and "small." The Assistants thus never feel at home in presence of their officers and free intercourse between research workers, which is so essential for creating a research atmosphere, is wanting. What is needed is the spirit of brotherhood, a community of scientific interest, in which social boundaries and petty disciplinary considerations are ignored. In my opinion, recruitment of qualified Indians into the research sections of the Agricultural Departments will be conducive to the creation of this atmosphere. In research sections more than anywhere else is a complete Indianisation absolutely essential. Far be it from me to suggest Indianisation at the risk of efficiency, but I maintain that there is a sufficient number of fully-qualified Indians from British Universities available in the country.

Besides removing the above defects of organisation and administration the following measures will lead to success in research:—

(1) *Universities and Agricultural Research.*—So far researches in agriculture and allied sciences have been mainly carried out by the Departments of Agriculture and only in a few cases have the staff of science colleges and universities taken part in this work. A grant of a scholarship by Sir Ganga Ram for research on fertilisers is the first instance of its kind. Our Universities have well-developed Chemical, Physical, Botanical and Zoological Sections and grant degrees by research. Efforts should be made to enlist the workers in colleges and Universities for the development of agricultural research. The Central Government as well as the Provincial Governments should set apart certain sums of money to be given as grants-in-aid for carrying on

investigations in science colleges and Universities on problems bearing on agricultural development. The Agricultural Department should circulate for the benefit of workers outside the department a list of problems awaiting solution. In my opinion, a scheme of this nature will be conducive of enormous good both to the department and the Universities. This system was in vogue in Britain in 1916. The Secretary, Board of Agriculture, circulated lists of problems awaiting investigation and university students selected the problems and worked them out at their own Universities.

(2) *Agricultural research and private enterprise.*—The department will do well to stimulate private enterprise and induce men of training and experience to take share in agricultural research. The best way to do this will be to advertise the problems and give special grants to those who undertake work and substantial prizes to those who offer the best solutions. Such a system will provide scope for work for trained men from foreign Universities who are without jobs, and also for those who have retired from service.

(3) *Scholarships and grants for research.*—In the Punjab, there is one post-graduate scholarship to be awarded every year to a student of the Punjab Agricultural College. There should be special scholarships for science graduates who wish to receive training or undertake research in agriculture. The Indian Central Cotton Committee are giving scholarships for such training, but there is scope for a great deal more. Every expert at an Agricutlural Institute should have a sum of money at his disposal for giving small grants to approved research workers.

(4) *Facilities for foreign training.*—To raise the tone of research work that is being conducted in our institutions we should provide facilities for all research workers to gain experience of work in foreign Universities and research institutions. The officers of the department who have received foreign training should get a substantial technical allowance over and above their pay.

Financing research.—The present system of annual grants to be spent within the year is very defective. While during years of plenty it leads to extravagance, during years of stringency it hinders progress. A Development fund should be started for research and, beside contributions from the Governments, all earnings and savings of the department should go towards this fund which should in due course be so big as to make research independent of help from the State. In cases of urgent necessity, interest on this money could be utilised. I am of opinion that research finances and control should not be dependent on popular vote.

(*b*) and (*c*) [Please see answer to Question 4 (*b*).]

The following entomological problems deserve attention:—

(1) Agricultural practices in relation to pest control.

(2) Relation between the "healthy" condition of the plant and pest attack.

(3) Meteorological factors and pest outbreak.

(4) Possibilities of dusting high trees by means of aeroplanes, particularly in connection with mango hopper control.

(5) Termites and their control.

(6) Pests of stored grains.

(7) Pests of fruit trees.

(8) Pests of sugarcane, particularly borers.

(9) Insecticides and fumigants, and dusting, spraying and fumigating machinery.

(10) Manufacture of insecticides, particularly poisonous gases.

I am of opinion that there is considerable scope for improvement in the domestic economy of the farmer's home. A study of the problems involved will be useful in discouraging wasteful practices.

Mr. Mohammad Afzal Hussain.

QUESTION 2.—AGRICULTURAL EDUCATION.—(i) The supply of institutions n so far as collegiate education is concerned is quite sufficient. In fact there are too many Agricultural Colleges in the country. In my opinion, it will improve matters if the two agricultural colleges in Northern India are combined into one teaching institution, providing accommodation for 500 students. Such an institution will be quite enough for the needs of the country for another thirty years.

The teaching staff of the provincial Agricultural College is quite sufficient but, in some cases, better type of teachers is required. The main defect, however, is that teaching research, and district and propaganda work are kept together under the same expert. In this arrangement, teaching is liable to be ignored and has actually suffered. I am of opinion that teaching should be in charge of a staff not saddled with other duties. This does not mean that teachers should not undertake research, but research should not interfere in the teaching work as at present. Further, Agricultural Colleges should be in charge of men who take active interest in matters educational and are competent by training and experience to run educational institutions, and are prepared to enter into the spirit of the corporate life of a college.

(iv) Those who seek admission to the Agricultural Colleges do so solely with the object of obtaining Government appointments. The success of an Agricultural College, therefore, depends directly on the appointments available for agricultural graduates in Government Departments. Therefore the number of students joining Agricultural Colleges will remain low.

(v) In 99·9 per cent. cases, the only incentive which induces lads to study agriculture in a college is to attain a job, in a high school to get an easy pass, and in vernacular middle schools, where English has not been provided for, there is no choice.

(vi) In Agricultural Colleges, the pupils are not essentially drawn from the agricultural classes, but at the time of admission preference is given to those who possess land.

(vii) The courses of study in the Punjab Agricultural College are to be modified shortly when the standard for admission will be raised from Matriculation to the Intermediate Science Faculty. When this change comes, it is hoped many defects will be removed.

(viii) (*a*) *Nature study.*—I am of opinion that nature study is the most useful subject for school boys and girls. If associated with drawing and painting, it does more to develop a child's mind that any other branch of training. To make it interesting it should be well taught by competent teachers. Arrangements are being made by the Education Department for proper training of such teachers.

(*b*) *School plots.*—For boys over 10, school plots are a very useful means of imparting information about agricultural matters.

(*c*) *School Farms.*—Agricultural farms connected with rural Middle Schools, if well managed, are of considerable use as demonstration centres for the adults, but the boys avoid the drudgery of working on these farms and the work is in fact too hard for lads of 10—15.

(ix) The careers of most of the boys who have studied agriculture in an Agricultural College is Government service.

(xii) Adult education should be considered under two distinct heads:—

(i) *Removal of illiteracy*—which is a slow process and rather tedious both for the teachers and pupils.

(ii) *Imparting information*—which can be made interesting and attractive. For adults this part of education should be made the

basis for training and removal of illiteracy should follow from this. For imparting useful information regarding crop production, crop protection, animal breeding, marketing, co-operation, village hygiene, civics, &c., &c., posters, lantern slides and cinematographs should be employed. In fact, the mind should be trained by advertisement to do the right thing unconsciously.

The work which is being done by the Rural Community Board in the Punjab is in the right direction.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(*d*) During the last five years, the Entomological Section of the Punjab Agricultural Department has been carrying out demonstrations on rat extermination by poison baits. Some people object to rat killing on religious grounds and others consider it a degrading occupation only fit for the *kamins*. One has to do a considerable amount of propaganda to overcome the prejudices of the people. Personal touch and discussions with individual cultivators have often proved of the greatest value. An area very often over one thousand acres is selected for the operations, and the scheme of work is explained to all the cultivators. Then the organiser—a member of the Entomological Section —gives the lead by starting work with his own hands. His example is readily followed. To convince the cultivators of the efficacy of the methods employed they are persuaded to collect dead rats from their fields, and often large heaps of dead rats are brought together. By these methods people are trained to look upon rat extermination in the same light as weeding. The success achieved is demonstrated by the fact that, for the first time in the history of the province, Sialkot, Ferozepore, Jullunder, Hoshiarpur and Gurgaon District Boards have come forward with substantial grants for rat extermination campaigns, and more requisitions for rat extermination than we can attend to are received from farmers. During the last four years 445,112 acres have been treated in 826 different localities and not one case of poisoning by mistake or design has occurred.

Similar success has been achieved in the use of light traps against *Amsacta*, a serious pest of crops in the Punjab. Free intercourse with the people, and personal interest in their welfare have led to this success.

QUESTION 4.—ADMINISTRATION.—(*a*) The existence and increasing popularity of such organisations as the Imperial Bureau of Entomology and Mycology, and the International Bureau of Agriculture demonstrate that research workers of the world recognize the importance of co-operation and co-ordination in the advancement of science. There can hardly be any difference of opinion on the question that for progress of agricultural research in India some co-ordinating agency is absolutely essential. Divergence of opinion, however, exists regarding the powers and scope of such an agency.

Brief annual reports, biennial meetings of the Board of Agriculture, and sectional meetings held at Pusa are very inadequate attempts at co-ordination. At present, therefore, workers at the research institutes under the Governments in India proceed along their own lines without, in many cases, knowing what is being done by others. Evidently a system which will bring about co-operation and co-ordination is required. The organization of the Indian Central Cotton Committee has stood the test well and may be taken as a model. Before the inception of this committee, isolated attempts were made by Provinces for the improvement of cotton, and the work has now been organized on sounder basis.

The branch of agriculture which may be termed "Crop improvement" yields best to organization on a wider basis, and it is in this direction that Governments in India can co-operate and the Central Governmet co-ordi-

nate and supplement their activities. Research on crop improvement may be roughly classified as below:—

(1) Improvement of indigenous varieties:—
  (i) Isolation of pure types.
  (ii) Hybridisation.
  (iii) Selection.
(2) Introduction of foreign varieties:—
  (i) Importation.
  (ii) Acclimatization and selection of suitable strains.
  (iii) Hybridization with indigenous types.

Evidently, therefore, duplication of work on isolation of pure types will be valueless and in fact lead to confusion. Similarly, the work of introduction of foreign varieties could be done better by a single agency. And a central organisation, not essentially a central institute, will meet the requirements. A central organisation could distribute the work among workers under the Government of India and the Provincial Governments.

Again hybridisation and selection could be carried out better by an organized body of scientists than by a large number of independent workers. Field trials of the varieties produced could be best left in the hands of the Provincial District staff. Two of the main crops of the country, i.e., cotton and sugarcane, are being dealt with along these lines, and it will be of great advantage to the country if improvement on other crops is organized on similar bases.

(*b*) From personal experience of work both in a Province and under the Government of India, I have come to realise that many problems of agricultural improvement require a broader outlook than that of a worker in a province, with his eyes fixed on immediate ends.

It must, however, be recognised that scientific experts employed under the Government of India should be men of very high qualifications and distinction, who are able to command respect by virtue of their scholarship and research and do not depend on the status of their office for their prestige. It will be only then that the central institute shall maintain its supremacy over the provincial institutes, which supremacy is essential if it is to serve its purpose as a model and guide for all agricultural research in India. Efforts thus should be made to bring about co-ordination more by offering advantages to the provincial workers than by mere organisation. An organisation paves the way for concerted action, but it is the individuals that put life into an organisation. If officers of the Central Institute, like the generous parents, employ the attitude of "give," without "take," a co-ordinated research is sure to result.

Before the Agricultural Research Institute, Pusa, is able to attain that supremacy which is essential for the above objects there must be a great increase in its staff. A well-equipped and well-manned Central Institute will be of immense help to the Provinces.

The control of co-ordinated research work is a difficult matter. In the Province, in so far as entomology is concerned the field operations, propaganda and research, are carried out by the same staff, and the Entomologist is also responsible for teaching. If it is possible to separate research from other activities, the matter will be simplified. Either the entire research staff could be placed under the Government of India or the provincial workers could be associated in a scheme of research. Taking sugarcane pests as an instance, the work could be distributed as follows: All taxonomic and morphological work could be done at a Central Station, study of life-histories could be assigned to some of the Provincial workers, and certain stations could be put on to investigate the possibilities of biological control, discovery of immune varieties and so on. The team work will lead to quicker and surer results. It must be recognized, however, that

a certain amount of jealousy between different workers is inevitable, but a good man at the head of affairs should be able to smooth down matters.

In short, a number of problems of all-India importance should be outlined by a board of experts, on which growers and traders and other interests should be represented, and for the investigation of such problems a committee should be appointed consisting of scientific experts of the Government of India and the Provinces. This committee should lay down the policy and distribute the work. If a provincial Government has a staff for a problem, then that staff should be associated with the work undertaken; if not the Government of India should take up the problem No general policy for administrative control can be laid down. Each individual case should be dealt with on its merits. If the Central staff carry out investigations without interfering with the Provincial staff the former should be under their own Government. When the work will be better carried out under the administrative control of the provincial Governments, then the officers of the Central Institute should be temporarily placed under the local authorities. Care must be taken that the individual does not suffer any loss in promotion or prestige.

A really strong Central Institute, well supplied with funds and staff, and which commands international reputation for standard of work produced and facilities for research offered, will soon make its presence felt.

In entomology, the Government of India can usefully supplement the activities of the local Government in the following manners:—

(1) Maintaining an adequately staffed institute for carrying out insect survey, keeping a collection of identified insects, and by identifying specimens for the Provinces. The work is being done at Pusa, but it should be done on a much larger scale.

(2) Maintaining a library as complete as possible.

(3) Acting as information bureau on all entomological matters.

(4) Undertaking research on the importance of pest control by parasites.

(5) Establishing agriculture stations for experiments and for supply of improved races of honey bees.

(6) Carrying out investigations on insecticides and fumigants and machinery for dusting and spraying

(7) Starting an Indian Entomological Journal.

(8) Training post-graduate students in pure and applied entomology and providing facilities for research.

(*c*) (ii) *Railways and steamship companies* should provide special concessions for imports and carriage of manures, fertilisers, seeds, implements and machinery. Railways could co-operate in propaganda work by organizing exhibition trains.

(iv) *Meteorological Department* supplies daily reports from certain localities. For purpose of correlating agricultural experiments with meteorological conditions the available data are far from satisfactory Reporting stations should be multiplied, particularly in localities where climatic differences in neighbouring areas are very great.

(v) *Postal Department* could provide facilities to the cultivators in approaching the Department of Agriculture, and all letters addressed to the department should be carried post free.

(vi) *Telegraph and Wireless Department* may supply market news at low rates. The inland telegraph department should undertake to send free of charge information regarding appearance of pests and diseases.

QUESTION 10.—FERTILIZERS.—Green manuring has been recommended by the department as a solution of the problem of shortage of natural manures and it has under experimental conditions given excellent results, but on

certain farms where the practice has been continued for a few years, it has led to the increase of white ant attack. In certain fields at the Agricultural Research Institute, Pusa, it has become a problem to save crops from the ravages of these insects. Organic manure unless well rotten is bound to increase termites. The problem, therefore, is either to find out some plant which, added to the soil, will improve its fertility and at the same time act as deterrent, or discover a combination of natural and artificial manures as will serve the purpose. This is a problem which might well be taken in hand by the Central Institute simultaneously in various tracts of the country.

The question of the export of natural manures, oil cakes, and oil seeds should be gone into very thoroughly.

(*f*) We should encourage the farmers to burn crop remnants. Hedges of suitable quick growing plants should be encouraged, and in deciding the cropping scheme the supply of fuel should be taken into consideration. Small woods may be grown round villages. The common *chulah* is not the most economic form of range and great improvement is needed in it. No attention has been paid to "Farmer's Home Economy" and I am certain that, when attention is devoted to this side of agriculture, the consumption of fuel in the house of a farmer will be considerably reduced and that will consist of cotton sticks, stubbles of cane and *juar*, &c. Improvements in *gur* boiling furnace designed by Malik Sultan Ali, Deputy Director of Agriculture, Gurdaspur (Notes on the harvest of cane and manufacture of *gur* in the Punjab) are so significant that great hopes can be entertained for the improvement of the *chulah*. Intensive propaganda should be carried on against the use of cow dung for fuel.

Sericulture and lac-culture indirectly serve to provide fuel for the cultivator. The branches of mulberry and *ber* trees after removal of leaves and lac are used as fuel.

It appears that for some purposes, such as slow boiling of milk and *huqqa* smoking, it will be difficult to replace cow dung cakes unless something better suited is available.

QUESTION 11.—CROPS.—(iv) A detailed note on the subject was submitted by me to the Board of Agriculture in India held in 1925, and was published in the Proceedings, pages 97-101. The following is the summary of recommendations then made:—

(1) A thorough study of the problem should be undertaken by competent officers, and the habits and behaviour of different wild animals should be carefully observed.

(2) As an experimental measure, a district should be selected for work and the cost of various operations and the effectiveness of various means of control ascertained.

(3) A campaign of vigorous propaganda should be undertaken to create public opinion.

(4) Legislation to ensure smooth working of preventive and control measures and co-operation of the people should be enacted.

(5) Co-operative societies for the purpose of fencing, baiting, trenching, &c., &c., should be started.

(6) Contributions should be made by the Governments for the purpose of controlling wild animals.

To my mind, it appears that the best solution of the problem would be to use either an irritant or a poison gas to deal with the wild animals like pigs, jackals, &c. Attempts can also be made by controlling watering places and grazing grounds, to take these animals away from cultivation.

QUESTION 13.—CROP PROTECTION.—(i) In my opinion, the existing legislation adequately provides for the protection of crops against external

infestation, with pests and diseases, but the actual carrying out of the regulations is far from efficient. The work of fumigation against insect pests is entrusted to the officers of the Customs Department who carry it out as a routine measure. There is no system by which a record may be kept of insects introduced, and we are completely in the dark as to what we should guard against. I will suggest the creation of a regular Quarantine Service consisting of properly trained Entomologists, who should carefully study the problem, keep an accurate record of insects intercepted, and investigate the results of fumigation.

I am also of opinion that, while, on the one hand, we should legislate against the introduction of a foreign pest, on the other, we should study the life histories of the pests likely to be introduced and their behaviour during transit and discover which of them will be able to survive the changed conditions and get established in this country.

It may, however, be pointed out that legislation to safeguard against introduction of pests and diseases by overland routes are incomplete and require careful investigation.

(ii) Under this heading, I will consider movement of affected plants from one part of the country to the other, including Indian States and possessions of foreign powers. At present there is no restriction against transport of affected plants from one part of the country to another. Potato moth, having been imported into Bombay from Italy, has come up to the Punjab. Similarly, scale insects, having spread in Kashmir, are likely to spread into fruit tracts of the Punjab. There is a considerable movement of fruit trees and other plants from one part of the country to the other, and there is no legislation enforcing nurserymen to sell "clean stock."

Legislation to safeguard against spread of pests and diseases should be effected.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(*c*) *Bee keeping.*—The local supply of honey comes chiefly from wild bees mainly from the hilly localities and forests. Bee-keeping, however, is practised in the hilly tracts of the Punjab where people make hives of crude form in the walls of their huts. So far, no attempt has been made by the Department of Agriculture to place this industry on a sound footing.

There is great demand for bees of good breeds from all over the country, and it is essential that the Government in India should take up the question and investigate fully the present state of the industry and its future possibilities. The Central Government should start a few stations in suitable localities, under a qualified expert with an adequate staff. Experiments on the introduction of foreign strains, crossing, &c., should be carried out.

The Government of the Punjab have already sanctioned an Assistant for this work and it is hoped will sanction the establishment of experiment and demonstration station.

Sericulture (rearing of mulberry silkworms).—Sericulture is a well-established cottage industry in certain localities of the Punjab, such as Gurdaspur, Hoshiarpur and Kangra and is practised in Sialkot, Rawalpindi, Campbellpur, Jhelum, Gujranwala, Lahore, Amritsar, Ambala and Sheikhupura. During 1926, the number of silkworm rearers was 1,215 and the total estimated produce of 275 maunds of dry cocoons was valued at Rs.44,000.

The spread of this industry is limited by climatic conditions, and it is only in the submontane tracts that it can be carried on successfully. Further, the development of this industry is limited by the available supply of mulberry trees. In very few localities are the worms reared on private trees and not less than 80 per cent. of worms are reared on trees growing

on the canal banks, along road sides or in forests. The rearers are charged Rs.1-8-0 per ounce of seed reared when Government trees are used.

The Department of Agriculture has during the last six years established mulberry plantations on the Upper Bari Doab Canal, and the work is being continued. If trees are available, the industry could be increased rapidly.

Attempts have been made to produce seed locally, and it is hoped a grainage shall be established soon.

The progress has not been satisfactory and this has been due to—

(*i*) want of a definite policy.

(*ii*) lack of co-operation between the various departments concerned in sericulture.

Unless the Irrigation Department, Forest Department and District Boards undertake to plant mulberry trees nothing much can be achieved.

The disposal of silk cocoons has also presented considerable difficulties. On account of depreciation in the value of the franc, big reeling factories are not prepared to buy silk cocoons. Reeling industry should therefore be encouraged. The Department of Industries has taken this matter in hand.

[On an average by rearing one ounce of seed a family can add to their net income a sum of Rs.50.]

Lac Culture.—Lac grows naturally in Hoshiarpur District, where its total annual value is put down at 4 lakhs of rupees. Lac also grows in small quantities in Roktak, Gurgaon, Ambala, Kangra and Gurdaspur Districts. The most favourable localities for lac culture are the submontane tracts. A farmer possessing 20 *ber* trees (*Zizyphus jujuba*) may add to his net income about Rs.60 a year.

The yield of lac could be increased at least three times and it could be introduced into many localities. The main obstacle in the way of the expansion of this industry are:—

(*i*) Absence of organisation and ignorance of the methods of inoculation and proper cultivation of lac.

(*ii*) Want of supply of good brood lac in sufficient quantity during years when local crop fails on account of high temperature.

(*iii*) Inadequate staff.

It was only recently (1925) that the local Government sanctioned one Assistant for lac culture work.

(*h*) Efforts should first be made to make people conscious of the fact that the conditions of their surroundings are unhygienic. A full and vivid account should be given of the factors responsible for dirt and disease, and consequences of these. An intensive propaganda should be carried out so that young and old, boys and girls have uppermost in their minds the feelings such as the following:—'kill the fly, it carries cholera,' 'exterminate the rat it spreads plague,' 'fill up that cesspool, it breeds mosquitoes which carry malaria.' When a strong community feeling against filth and disease has been created, then practical steps should be taken, campaigns organised, plans of action worked out in full details, and co-operation of the people insured. The action when once started should be carried to the finish in a most business-like manner. Societies of farmers with definite objects should be started and encouraged. Boys and girls are more susceptible to new ideas and should be employed for carrying out propaganda and actual measures against diseases.

Enterprising farmers should be encouraged to build model houses with good drainage, and model villages should be started in the new colonies.

Investigations on the proper disposal of refuse should be undertaken so that the farmers are suggested methods which appeal to them.

Question 22.—*Co-operation.*—(*b*) (*vii*) Societies for joint farming, if established, will be a great blessing for the agricultural community. From the crop protection point of view such societies are a necessity. No measure of pest control can be successful unless carried out simultaneously over large areas. Clean cultivation is impossible under the present condition, but, with the development of the co-operative movement the feeling of mutual help will develop and then it will be possible to attempt to control such pests as sugarcane borers, the only satisfactory method against which is the safe disposal of stubbles and destruction of alternative food plants.

Similarly rat extermination societies, pest control and spraying societies and anti-disease societies will serve a very useful purpose.

(c) I am certainly of opinion that legislation should be introduced in order to compel people to join in for the common benefit of all.

Question 24.—*Attracting Capital.*—(*a*) Men of 'capital and enterprise' need no inducement to take to agriculture. In the past the land had been passing from the actual cultivators into the possession of men of capital, and the process was so rapid that special measures to protect the land-owner from the enterprising capitalist had to be devised and the Punjab Land Alienation Act was passed.

The Punjab had been called 'a country of peasant proprietors,' and the problem before the administration is 'How to maintain the peasant proprietor upon his land in freedom and comfort?' Inducement offered to men of capital and enterprise will mean exploitation of land and labour. With capital and enterprise the land and labour can certainly be made to yield more but at the risk of killing the peasantry. The aim should not be the exploitation but the welfare of the zamindars. I am strongly of opinion that the State should take the place of men of capital and enterprise and keep out the individual profiteers from the field.

Oral Evidence.

46,657. *The Chairman*: Mr. Afzal Hussain, you are Entomologist to the Punjab Government?—Yes.

46,658. We have your note of evidence; do you wish to add anything to it, or may we ask you a few questions?—I have nothing to add.

46,659. Would you give the Commission quite shortly an account of your own training and past appointments?—I graduated from the Punjab University with honours in Zoology and I took the degree of Master of Science from the same University. After that I went to Cambridge where I took both parts of Natural Sciences Tripos; in the second part I studied Zoology and I got Class I honours, and I was awarded the Frank Smart Prize of the University of Cambridge. After taking my degree, I was in Cambridge for three years and I did research work on Applied Entomology and also on *crusacea*. For research work I received scholarships from my college and grants from the India Office, the Royal Society and the Balfour Research Fund of the University of Cambridge. I was awarded the Charles Darwin Prize of Christ's College, Cambridge, for research work. I left England in December 1918 when I was appointed by the Secretary of State as Supernumerary Entomologist, Agricultural Research Institute, Pusa. I was there for about eight months when I was transferred to the Punjab as Entomologist to the Punjab Government. I was retransferred to Pusa in April, 1925, as Officiating Imperial Entomologist and I was there for eighteen months. I returned to the Punjab last November. I have been conducting and guiding research work of the Entomological Section, Punjab. We have published about 25 papers on original investigations.

46,660. You have had the experience of a training both in Europe as well as in this country. Do you think it is to the advantage of Indians that they should go to Europe, or that they should be trained in India?—It would be a distinct advantage to Indians if they could go to Europe for higher training.

46,661. Why is that so?—Because in this country at present we have not got the same atmosphere, the intellectual and educational atmosphere which exists in Western Universities.

46,662. You think yourself that you have the teachers?—Very few of the same standard as you get in Cambridge or Oxford.

46,663. At what stage in his career do you think an Indian should be advised to proceed abroad for higher education?—I am of opinion that an Indian gets the best advantage from his training in Western Universities when he goes after graduating from a University in this country.

46,664. You think that he should go for his post-graduate training out of India, either to Europe or America?—Yes.

46,665. I see from page 860 of your note that you are impressed with the soundness of the type of organisation of which the Indian Central Cotton Committee is an example. Do you feel that that principle might be applied to research on other crops?—Yes, I think that principle should be applied to other main crops of the country.

46,666. That is to say organisation on the basis of the crop rather than upon any territorial organisation?—Yes.

46,667. Are you doing any teaching yourself?—Yes, I teach about two periods a week; I lecture to the first year students.

46,668. Any graduates?—Entomology is not taught beyond the two first years in the Punjab Agricultural College.

46,669. But I suppose you might find that a graduate was anxious to come to this college in order to be trained under your guidance?—Yes, I have had a very large number of them coming from the Government College at Lahore for training in entomology.

46,670. What do you think of their standard of knowledge when they come to you?—The standard of knowledge as far as entomology is concerned is very low. This is a specialised subject and there is no institution in India where it is taught by anybody who is well acquainted with it. It is only taught as a very small part of a course in zoology and they do not go beyond the eight order stage which is very, very elementary indeed.

46,671. Do you not think that that is greatly to be regretted?—Yes, very greatly to be regretted.

46,672. Would you turn to page 858 of your note: in answer to Question 1 (*a*) you suggest the creation of a development fund. How do you suggest that any fund of that sort should be administered?—It would be administered, if we go in for centralised research, by the central institution or by the committee running that central institution.

46,673. What, in your view, are the advantages of a development fund over the system by which research is financed year by year in the annual budget?—Under the present system when there is plenty of money the departments get quite enough and sometimes more than they require, and they spend on things which probably do not bring good returns, whereas in years when no funds are available research suffers and progress is hindered.

46,674. You cannot open and shut research like a concertina, can you?—No.

46,675. What you want is to get security for the future and continuity of policy?—Yes.

46,676. Would you turn to page 864 of your note, Question 13 (2). You are dealing there with the danger of conveying epidemic diseases from one

district to another and you say that at present there is no restriction against the transport of affected plants from one part of the country to another. Do you think it would be possible to institute any control of that sort?—It is quite possible, but it would be difficult in the beginning. It is quite possible particularly if we have legislation to force people who own nurseries, to send out clean plants, without fungus and insect diseases.

46,677. I see on page 864, in answer to our Question 17 (*c*), you say there is a great demand for bees of good breeds from all over the country. Is the indigenous bee a good bee for making honey?—It is not very good.

46,678. It is more militant than acquisitive?—Yes.

46,679. What breed of bee do you suggest should be introduced?—I have never done any work on apiculture myself; we shall have to investigate this matter by introducing various breeds from Italy, France, America, and so on.

46,680. Is it mainly on flowering trees that the honey is made?—Yes.

46,681. One does not see many wild flowers in the jungle?—We find a large number in the hilly tracts.

46,682. Is it only in the hilly tracts that you yourself think there is a future for bee-keeping?—Yes, mainly in the hilly tracts.

46,683. Would you tell us what you regard as the two most important lines of research upon which you are engaged at this moment?—We are engaged on the cotton pest, particularly the pink bollworm which we are studying from the meteorological point of view. We find that in the canal colonies where most of the cotton of the American variety is grown this pink bollworm is absent, while in the rest of the Punjab it is a very serious problem. We are studying the reason for that, so that we may discover what climatic conditions are favourable to its development and what are adverse to its increase in numbers. We are also, from the purely applied entomology point of view, studying the control of a very serious pest known as *Amsacta*, commonly called *kutra*. We planned a campaign last year to destroy this moth by light traps and next year we are organising a very large campaign to demonstrate to the people the efficacy of the light traps. We are also carrying on the work of extermination of rats (I should rather say destruction because it is an animal which can never be exterminated).

46,684. Let us take the moths first. What do these moths attack?—Practically every crop. Then all over the Punjab the rat problem is very serious, and we send out a staff to teach the people the methods of rat destruction by poisoning and also by fumigation.

46,685. Why does the rat come under the Entomologist?—Because there is nobody else to deal with it. The pink bollworm scheme is financed by the Indian Central Cotton Committee, and it was only three years ago that we started this work.

46,686. So that that is a good instance of co-ordination?—Yes.

46,687. And you are not troubled there with any fear for the future?—No.

46,688. Nor any lack of co-ordination?—No. The scholar of the Indian Central Cotton Committee was up at Pusa last year, and he was allowed by the Committee to visit the various centres where work on the pink bollworm was being carried out.

46,689. How about your staff for that particular investigation?—I have an Assistant in the Provincial grade, and under him there are three field assistants in the Subordinate grade getting about Rs.75. We have also a menial staff of field men for the ordinary routine work.

46,690. How about the *amsacta* moth?—Our present difficulty is that for next year we have not got the funds even to take one village in a *zail* and demonstrate to the people how the work is done, and further there is no staff for such a big work.

46,691. Do you choose your own lines of advance and research?—Yes, so far I have always chosen my own lines of research.

46,692. Does that arrangement suit you or would you prefer to have some over-riding authority who would indicate the lines of progress which in his judgment you should pursue?—It is a very difficult question to answer; If the over-riding authority is very sympathetic, I would like to have an over-riding authority; if the over-riding authority is a hindrance, I would much rather be left alone. Some persons hold that the ideal over-riding authority is one that lets you do what you like and takes the responsibility.

46,693. *Sir Thomas Middleton*: You refer to the absence of a research atmosphere in the Indian Universities; no doubt you are familiar with the history of research in our European Universities?—Yes.

46,694. In what stage was science 75 years ago? Was there much of a research atmosphere then?—Not quite so much.

46,695. It does not take a very long period in a nation's history to create a research atmosphere if conditions are favourable?—It does not take very long at the present stage of our growth.

46,696. What hope do you see of creating a research atmosphere in the Indian Universities?—In the Indian Universities that atmosphere has already been created; I could refer to the Lahore University where they have a very good school of zoology and chemistry, and I believe they will very soon have good schools in other sciences.

46,697. So that you think the prospects are quite hopeful?—Quite hopeful.

46,698. Do you think all steps should be taken to foster the development of the research atmosphere in the Indian Universities?—Certainly.

46,699. You think we have enough agricultural colleges in the North of India?—Yes, I think we could reduce them by 50 per cent.

46,700. You talk of combining the two colleges of Northern India; which do you refer to?—I had particularly in mind the Agricultural College, Lyallpur, and the Agricultural College, Cawnpore.

46,701. How could you effect that combination of two institutions so far apart? In what way would you combine them?—I would change one into a purely research institute and the second into an agricultural college; that is the most economical way of doing it.

46,702. Have you found a need for conferences between research workers since you have returned to India?—Yes, the need is very great indeed.

46,703. What opportunities have you had of meeting others engaged in entomological research?—At Pusa every other year there is a sectional meeting of the Entomologists; Entomologists from various Provinces go there and discuss various things, read papers and so on.

46,704. Is that sectional meeting once in two years sufficient, in your opinion, to secure the contact that is required?—That is the best that can be done.

46,705. *Mr. Barron*: In answer to the Chairman, you said you had no funds for demonstrating your work on the *kutra* moth in villages?—Not sufficient funds.

46,706. Have you applied for funds, or has the department applied for funds?—Not yet. We have only got Rs.1,500 from the District Board of Hoshiarpur. The intention was that the department should approach the Government to contribute a similar sum from Government funds; that

would mean Rs.3,000; that is hardly enough, we want something like Rs.15,000.

46,707. Has any such application been made to Government?—No, not yet.

46,708. Then it has not been refused?—Not in this particular case.

46,709. And, from past experience when your department has been able to prove the value of its research work, do you think it is likely that it will be refused when an application is made?—Yes; the proposal with regard to rat destruction has been with the Government for some years now and nothing has come out of it; I submitted a sericultural scheme, asking for a bigger staff, in 1921, but little has come of it either.

46,710. Perhaps the Government is rather doubtful about the possibilities of the success of a campaign for exterminating rats in the Punjab?—I have not been informed of it or I could have explained more fully that there is possibility of success.

46,711. But this work on the *kutra* moth has been proved to be in the right direction?—Yes, that is my impression.

46,712. In such cases are funds often refused?—I cannot say in this case. Last year we had some money, but it remains to be seen whether Rs.15,000 will be granted this year.

46,713. *Sir James Mackenna*: Is it not a fact that these sectional meetings of Entomologists last for about five or six weeks and the proceedings run to three enormous volumes as a rule?—For the last two years we have had them only for a week, six days.

46,714. You have cut them down?—Yes, the time has been cut down.

46,715. You have had the advantage of service both at Pusa and in a Province?—Yes.

46,716. Do you think it is an advantage for provincial officers to have an opportunity for a time of serving in the Imperial Department?—A very great advantage; it opens his eyes, he looks at things from a different point of view altogether, and he finds the problems are much bigger than he thinks when he is in a Province. I think I gained enormously by my stay at Pusa last time.

46,717. Do you think a system of drafting an officer into Pusa from a Province for a period of years, or an interchange of staff between the Provinces and Pusa for a period, would be of mutual help?—It would be of great help to the individual officer, though it would be difficult to carry on the work, because there would not be continuity of work.

46,718. What opinion did you form of the quality of work being done at Pusa?—It is very difficult to say, but I do not think the quality of the work is such as we should expect from an All-India institution.

46,719. Had you any experience of post-graduate students in your section when you were at Pusa?—Yes, I had one student who was there for a full course, and I had a number of students who were there only for a short while.

46,720. What opinion did you form of their scientific attainment when they came to you?—Their general knowledge of zoology was quite sound, but their knowledge of entomology was extremely poor.

46,721. What would you say of the general standard of science instruction in India?—The teaching of zoology is quite good, but it does not compare with Part II of Cambridge University which is far higher; it is quite good and it is improving.

46,722 And the standard of the student?—The standard of students is quite good.

46,723. *Professor Gangulee*: You have just stated that the quality of scientific research in Pusa is not so high; why is that so?—It is very difficult for me to go into the reasons.

46,724. What is it due to: lack of equipment?—The equipment is quite good, the library is excellent, but I should say that the atmosphere is lacking and the personnel is probably not so good as it ought to be.

46,725. You agree with me that Pusa has established itself as an important research station in the East?—Yes, certainly, because that is the only central research station in India.

46,726. Would you not agree with me that the quality of work done by men like Lefroy, Butler and Howard has gained a reputation for this institution as an important research institution in the East?—Yes, certainly. I was thinking of the quality of the work done now. The first batch of workers certainly did splendid work.

46,727. So you are of opinion that the quality of the work has deteriorated?—Yes.

46,728. Would you like to develop Pusa as a post-graduate training institution?—Personally I should.

46,729. Of the highest order?—Yes.

46,730. And you would have such a scientific staff there from whom research of the highest order may be expected?—Yes.

46,731. With regard to your own research work, from whom did the suggestion of the cotton pink bollworm research come? From the Central Cotton Committee?—We were asked by the Central Cotton Committee to state whether pink bollworm was a serious pest in that part of the Punjab which is adjoining the United Provinces. We suggested we had no staff to do this work. Then they wanted to have a preliminary enquiry; we made the preliminary enquiry, and we found it was a serious pest; but we could not take up this work unless staff was provided. Then they provided us with the staff and money and we are carrying on the investigation.

46,732. So, the Indian Central Cotton Committee put aside some funds for you for this purpose?—Yes.

46,733. Have you a separate officer under you?—Yes.

46,733A. As regards your own work I think you said, in answer to the Chairman, that you have published 25 papers of entomological research?—Yes.

46,734. Are these papers on one definite problem, or on a variety of subjects?—They are on different subjects, different insects.

46,735. Is it more or less systematic work or research on economic entomology?—It is almost all applied work.

46,736. That is to say, whenever you have undertaken research into a particular insect or a particular problem, you have carried it through?—I cannot say about every insect, but I think I can say we have completely studied about three insects.

46,737. So far as you are concerned there is there the continuity of research which you are very anxious to see in our research stations?—Yes, as far as entomology is concerned.

46,738. On page 856 of your note you say that the money has been spent on some problems of very remote interest to the cultivator; would you kindly tell us what are the problems you have in mind, giving us one or two instances?—It has been brought to the notice of the Commission that research on wireless telegraphy has been carried on by the Agricultural Department; in my opinion researches on wireless telegraphy are outside the scope of an agricultural officer.

46,739. But it has a bearing on the question of propaganda?—So has malaria a bearing on the efficiency of the cultivators.

46,740. Then you suggest, as one of the causes of this unsatisfactory degree of progress, that in some cases hobbies which are decidedly outside the work of an expert have been indulged in at the expense of more useful work; could you cite one or two instances of that?—I have just cited an instance which might be considered to be a hobby.

46,741. Is that the only case you have in mind when you make that remark?—I had not the time, but I suppose one could certainly point out other cases also.

46,742. In your own research work is there any such thing as team work?—Not exactly.

46,743. You understand what I mean: whenever, for instance, you want to study the life cycle of a particular insect, are you in touch with the other sections of the research institute?—There is no provision for that.

46,744. So you are not in touch with the other scientific departments in your own field of research?—No.

46,745. There you are not able to attack any problem in all its bearings?—No, we only go on on our own lines; that is one of the most serious drawbacks.

46,746. That is to say, the right wing of the laboratory does not know what the left wing is doing?—The right wing sometimes does not know what the central hall is doing.

46,747. You say here, as far as your department is concerned, there is mutual exchange of monthly reports between Pusa and Lyallpur?—Yes.

46,748. Is that your innovation?—No, I think it is from the Imperial Entomologist; he suggested it.

46,749. How is this system working?—It is simply a routine matter; we send round what we are doing and they send round what they are doing, but it does not lead anywhere.

46,750. Does not it assist you in your work?—Very little.

46,751. Are you very much handicapped with administrative duties?—Very much.

46,752. Do you want an officer, or would a secretary solve the difficulty?—It comes to the same thing whatever name you give him. I used the word "officer" in a very general sense.

46,753. What is the nature of the administrative work that you have to do?—We have to write a number of reports and answer a number of enquiries.

46,754. Reports on your own work?—Reports on the development of agriculture or sericulture, or a scheme for apiculture.

46,755. Surely that is technical work?—In a way it is.

46,756. These duties are not administrative duties?—They take a lot of time which could be devoted to research work.

46,757. *Mr. Calvert*: I understand that in this Province sericulture is under you?—Yes.

46,758. In other Provinces it is under the Director of Industries and not under the Entomologist; are you satisfied with the arrangement?—I am not quite satisfied with the arrangement; I have suggested in the scheme which I submitted in 1921 that a separate officer should be appointed, and when the industry is big enough it should be handed over to that separate officer.

46,759. And, of course, the same with regard to lac?—Yes. I have now suggested that if they cannot have a separate officer for sericulture they should have a separate officer for sericulture, lac culture and apiculture.

46,760. And put him under the Director of Industries?—It does not matter where he works, but he should not be under the Entomologist.

46,761. Is this work on sericulture and lac distracting your attention from more important work?—Greatly.

46,762. *Mr. Kamat*: With reference to this social atmosphere which you wish to establish and for which you suggest social functions such as tea parties, supposing grants were given by Government for tea parties, do you hope to solve the problem in that way?—I do not think people in the Punjab are so miserly as to take money from the Government for these tea parties; if the heads of the institution start this work, people would contribute money for these social gatherings.

46,763. What is lacking at present?—An inclination on the part of the heads of institutions to take an active part in the social life of the institutions.

46,764. *Mr. Roberts*: Do you regard it as the ideal that post-graduate training should be mainly in foreign countries or would you like to see it developed in India?—I would like to see the post-graduate training developed in India as much as possible, but I would still prefer the post-graduate student to go and visit other centres of research.

46,765 Your idea is that the best training, as far as you can see, is always likely to be obtained in some other country?—For some time to come.

(The witness withdrew.)

(The Commission then adjourned, this concluding the public sittings at Lyallpur.)

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GLOSSARY.

ANADI ... ... Village site, inhabited area.
ABIANA... ... ... Water rate.
AHIR ... ... A tribe of cultivators, mostly Hindus, renowned for careful husbandry.
ALU ... ... Potato.
ANNA ... ... One-sixteenth of a rupee; equivalent to 1½d. at exchange rate of one and sixpence to the rupee.
ARAIN ... ... A tribe of market gardeners, mostly Muslim.
ARHAR ... ... Pigeon pea (*cajanus indicus*).
ARTI (ARHTI) (ADTYA) (ARTYA) An agent or broker.

BABU ... ... A title of respect.
BABUL ... ... A widely-distributed small tree (*acacia arabica*).
BAJRA ... ... A small millet (*pennisetum typhoideum*).
BAKSHEESH ... ... A gift, tip.
BANIA ... ... A Hindu grain trader who is generally also a money-lender.
BARA (soil) ... ... Hard, arid soil, highly charged with alkali salts; also highly manured land close to the village site.
BAR ... ... Upland between confluent rivers; formerly waste.
BARANI... ... ... Unirrigated land depending on rain for its water supply.
BARU ... ... A tall perennial grass (*sorghum halepense*).
BATAI ... ... Payment of rent in kind by division of produce between landlord and tenant.
BELDAR ... ... A labourer.
BENAMI ... ... Purchasing or holding under a false name; *Benamidar*, the man in whose name such a transaction is done.
BER ... ... A moderate sized deciduous tree (*zizyphus jujuba*).
BERSEEM ... ... Egyptian clover (*trifolium alexandrinum*).
BHANGI ... ... A low caste employed as sweepers and menials.
BHISHTI ... ... A water carrier.
BHUSA ... ... The husk or chaff of grain; the straw.
BIGHA ... ... A measure of land; the standard or *pucca bigha* is 3,025 square yards or $\frac{5}{8}$ths of an acre; a *kutcha bigha* is in some places one-third and in others one-fourth of a standard *bigha*.
BUND (BAND) ... ... A dam, a field embankment.

CHAHI ... ... (Land) irrigated from wells.
CHAK ... ... A block or portion of land.
CHARAGAH (CHIRAGA) Grazing ground.
CHARI ... ... *Juar* grown for fodder.
CHARSA ... ... A leather bag used as a water lift.
CHAUKIDAR (CHOWKIDAR) A watchman.
CHITTANK ... ... A measure; one-sixteenth of a *seer*.
CHO ... ... Land damaged by a hill torrent.
CHULAH (CHUHLA) ... A fire-place.
CHUMOR ... ... A worker in leather, a low caste of Hindus.
CHURA ... ... A low caste of menials.
CRORE ... ... Ten millions.

DALAL ... ... An agent or broker.
DAREKH ... ... The bastard cedar (*melia azedarach*).
DESI (DESHI)... ... Native to the country; indigenous.
DHAK ... ... A moderate-sized deciduous tree with a brilliant red flower (*butea frondosa*).

DHANWAI ... ... A man connected with the selling, or threshing, of rice; DHARWAI, a man who weighs grain.
DHOTI ... ... A loin cloth worn by men.
DHUB ... ... Couch grass (*cynodon dactylon*).
DOAB ... ... A tract of land lying between two confluent rivers.

FASAL (FASL) ... ... Crop or harvest.

GHAIR MUMKIN ... Lit. not possible. Waste; land not capable of cultivation.
GHI ... ... Clarified butter.
GORADEH ... ... Land immediately in the vicinity of a village.
GOWALA ... ... A herdsman or milkman.
GOWARA ... ... See *Guar*.
GRAM ... ... Chick pea (*cicer arietinum*).
GUAR (GUARA) ... Cluster bean (*cyamopsis psoralioides*).
GUJAR ... ... A numerous class chiefly engaged in agriculture.
GUR ... ... Unrefined Indian sugar, jaggery.
GURGAON plough ... An inversion plough recently introduced in Gurgaon district.

HAKUMAT ... ... Authority.
HOOKAH (HUQQA) ... A pipe, a smoking tube.
HINDUSTAN plough ... A light inversion plough.
HISAB ... ... An account, a bill.

ILAKA (ILAQA) ... A tract, neighbourhood.
ISLAHI RASUMAT society ... A society formed with the object of reforming social customs.

JAGIR ... ... An assignment of the revenue of a given area of land.
JAGIRDAR ... ... The holder of any assignment of revenue.
JAIN ... ... A follower of JAINISM—a religious sect.
JAL ... ... Water.
JAMABANDI ... ... The essential portion of the record of rights in land wherein is entered the detail as to ownership, the revenue assessed, area, etc.
JANGLI (JUNGLI) ... Wild, waste, savage, belonging to the forest.
JAT ... ... The chief cultivating tribe in North-West India.
JHEEL ... ... A shallow lake, a swamp.
JIRGA ... ... A council of the village elders.
JOWAR (JUAR) ... The large millet (*sorghum vulgare*).

KABBADI ... ... A game.
KALLAR (KALAR) ... Saline efflorescence.
KAMIN... ... ... A menial.
KANAL ... ... A measure of land which varies in different localities; generally $\frac{1}{8}$th of an acre.
KANKAR ... ... Nodules of limestone found in the soil.
KAPAS ... ... Cotton with the seed still adhering (unginned cotton).
KASHT ... ... Cultivation.
KAZI ... ... Originally a law officer, now a title assumed by certain families.
KESHARI ... ... The chickling-vetch (*lathyrus sativus*).
KHANSAMA ... ... A house servant.
KHARABA ... ... (From *kharab*, bad). A remission of Government dues, granted when crops are below a certain standard.
KHASRA ... ... A record of the village lands in which the fields are numbered.
KHARIF ... ... The autumn harvest; crops sown at the beginning of the rains and reaped in October-December.
KHATI ... ... A grain pit.

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KHATRI ... ... A Hindu caste or tribe chiefly engaged in trade, money lending, etc., usually literate.
KHATTA ... ... The sour lime (*citrus acida*).
KIARI ... ... A field surrounded by a bank or *bund*.
KIKAR (KIKER) ... See *Babul*.
KITAB ... ... A book.
KOR ... ... A watering.
KUTCHA ... ... Inferior or bad. [Lit. "not solid."]

LAKH ... ... One hundred thousand.
LAMBARDAR ... ... A village headman who collects and pays the Government dues of the village and has other duties.
LANA ... ... A saltwort (*salsola fortida*).
LASSAN... ... ... Garlic (*allium sativum*).
LATIFUNDIA ... ... Large estates.
LOHAR ... ... A worker in iron, a blacksmith.

MA BAP... ... ... [Lit. father and mother.] A protector.
[redacted]HAJAN ... ... A merchant.
MAHAR... ... ... A low caste, generally village servants.
MAINA ... ... A small millet (*paspalum scorbiculatum*).
MAIRA ... ... See BARANI.
MANDI ... ... A market.
MANGO... ... ... An evergreen fruit tree (*mangifera indica*).
MARLA ... ... A measure of land.
MASH ... ... A pulse (*phaseolus mungo*).
MASUR... ... ... Lentil (*lens esculenta*).
MAULVI ... ... Originally a learned Muslim, a teacher; now used as a term of respect.
MAUND... ... ... A weight of 82·28 lb. (*pucca maund*); has different values for different commodities, and for the same commodity in different localities.
MAURUSI ... ... Hereditary; a *maurusi* (or occupancy), tenant retains a permanent lien on his land.
MAZARA ... ... A tenant.
MEGASSE ... ... Residue of sugarcane after the juice has been expressed.
MEO ... ... A class of cultivators.
MESTON (plough) ... A very light type of inversion plough.
MOHWA (MOHUA) ... A deciduous forest tree (*bassia latifolia*) whose dried flowers are eaten as food or distilled into liquor.
MOTH (MOTE) ... The kidney bean (*phaseolus aconitifolius*).
MUKADDAM (MUQADDAM) A skilled labourer.
MULBERRY ... ... A moderate-sized deciduous tree (*morus indica*); in the silk districts it is reared on the bush system.
MUNG (MONG) (MUNS) Green grain (*phaseolus radiatus*).
MUNSHI ... ... A writer, clerk, teacher.
MYROBALAN ... ... Tanning fruit obtained from trees of the genus *terminalia*.

NAHRI ... ... Irrigated (land).
NALI ... ... A tube, a seed drill.
NAWAB ... ... A title of honour.
NAZRANA ... ... A gift; a contribution in excess of the usual payment.
NILGAI ... ... Blue buck (*boselaphus tragocamelus*).
NULLAH ... ... A water course.

[redacted]... ... ... A mountain, hill.
[redacted]PANCHAYAT ... ... Lit. a committee of five. Used to describe an association of any number of persons, instituted for objects of an administrative or judicial nature.
PANDIT ... ... Originally a learned Brahmin, a teacher; now a term of respect applied to Brahmins.

PATHAN ... ... A Muslim tribe found chiefly in the frontier districts and West Punjab.
PATWARI ... ... A village accountant or registrar.
PHAL ... ... Fruit.
PIE ... ... One-twelfth of an anna.
POLI ... ... Wild safflower (*carthamus oxyacantha*).
PURDAH ... ... A veil, screen; the practice of keeping women secluded.

RABI ... ... The spring harvest; crops sown in autumn and reaped at the end of the cold weather.
RAIS ... ... A gentleman of standing.
RAJA(H) plough ... A type of inversion plough.
RAKH ... ... Waste woodland.
RAUNI ... ... A watering.
RODKOHI ... ... Irrigation from hill torrents.
ROSA BHATLA ... An improved type of *deshi* cotton.
ROSEUM ... ... A coarse short staple cotton (*gossypium neglectum roseum*).

SABZI ... ... Vegetables.
SAJJI plant ... ... One of the saltworts which thrive on alkali soil (*Sajji*, sodium carbonate).
SAILAB (SAILABI) ... Land irrigated by floods or percolation from a river.
SANAD (SUNNUD) ... A charter, certificate of honour.
SANN ... ... Bombay hemp, a leguminous fibre crop (*crotalaria juncea*); also used as a green manure.
SARKANDA ... ... A grass (*saccharum arundinaceum*).
SAROPA PAINA ... A system of irrigation from a hill torrent wherein those irrigating above have prior right to the water, those lower down getting what is left.
SARSHAF ... ... A kind of mustard.
SARSON ... ... An oilseed (*brassica campestris*).
SAWAI ... ... An excess of one-fourth; interest at the rate of 25 per cent.
SAWAK ... ... An annual fodder grass (*panicum frumentaceum*); also cultivated for its grain.
SEER ... ... A weight (2·057 lb.)
SENJI ... ... A fodder crop (*melilotus parviflora*).
SESAME (SESAMUN) ... An oilseed (*til*) (*sesamum indicum*).
SHAFTAL ... ... A fodder crop (*trifolium resupinatum*).
SHAMILAT ... ... Village common, usually used for grazing.
SHIKARI ... ... A hunter.
[redacted] ... ... A deciduous tree (*dalbergia sissu*).
SHROFF ... ... A moneychanger, a banker.
SIRIS ... ... A forest tree (*albizzia lebbek*).
SIRKAR ... ... The Government, the supreme authority.
SURRA ... ... A disease affecting horses and camels especially.
SYED ... ... A Muslim tribe from which the Prophet's son-in-law was drawn; usually regarded as the highest tribe among Muslims.

TACAVI (TAKKAVI) ... An advance made by Government to cultivators for agricultural purposes.
TAHSIL (TEHSIL) ... A local revenue division of a district.
TAHSILDAR (TEHSILDAR) A revenue officer in charge of a tahsil.
TAKLIF ... ... Trouble, difficulty.
TARAMIRA ... ... An oilseed (*eruca sativa*).
TARKARI ... ... Vegetables.
THAL ... ... A desert tract.
THANEDAR ... ... A sub-Inspector of police, in charge of a police-station.

Til	... An oilseed (*sesamum indicum*).
Tongawala ...	... The driver of a horse or bullock carriage.
Toria	... Rape (*brassica campestris*).
Usar	... Land impregnated with sodium salts and thereby rendered barren.
Val	... A pulse (*dolichos lablab*).
Wallah ...	... A person.
Warabandi ...	... Distribution of water in rotation.
Zail	... A group of villages in a *tahsil*.
Zaildar ...	... A rural notable appointed by Government, the head of a *Zail*.
Zamindar ...	... A landowner, a peasant proprietor.
Zilladar ...	... A canal officer.
Zira	... Caraway (*carum bulbocastanum*).

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