

13582

ROYAL COMMISSION
ON
AGRICULTURE IN INDIA

Volume I

Part III

EVIDENCE

OF

Officers serving under the Government of India
and of Witnesses from Minor Provinces



CALCUTTA GOVERNMENT OF INDIA
CENTRAL PUBLICATION BRANCH
1928

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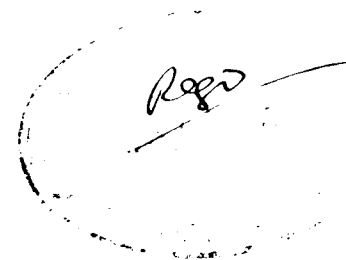
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INTERIM REPORT

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 certain additional minutes of the evidence which we have taken 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.
(..) GAJAPATI NARAYANA DEO.
(..) N. GANGULEE.
(..) L. K. HYDER.
(..) B. S. KAMAT.

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

26th January 1928.

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TERMS OF REFERENCE

Generally,

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

In particular to investigate—

- (a) the measures now being taken for the promotion of agriculture 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.

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

QUESTIONNAIRE

PART I

Question.

1. Research.
2. Agricultural Education.
3. Demonstration and Propaganda.
4. Administration.
5. Finance.
6. Agricultural Indebtedness.
7. Fragmentation of Holdings.

PART II

8. Irrigation.
9. Soils.
10. Fertilisers.
11. Crops.
12. Cultivation.
13. Crop Protection.
14. Implements.

PART III

15. Veterinary.
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PART IV

17. Agricultural Industries.
18. Agricultural Labour.
19. Forests.
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 ?
- (v) What are the main incentives which induce lads to study agriculture ?
- (vi) Are pupils mainly drawn from the agricultural classes ?
- (vii) Are there any modifications in existing courses of study which appear to be called for ; if so, what are they ?
- (viii) What are your views upon (a) nature study ; (b) school plots ; (c) school farms ?
- (ix) What are the careers of the majority of students who have studied agriculture ?
- (x) How can agriculture be made attractive to middle class youths ?
- (xi) Are there recent movements for improving the technical knowledge of students who have studied agriculture ?

- (zii) How can adult education in rural tracts be popularised ?
 (ziii) 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.

(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.

(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 carcasses, 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

(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?

18. 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

the method by which each transaction is financed, 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 ?

ROYAL COMMISSION ON AGRICULTURE.

MINUTES OF EVIDENCE

TAKEN BEFORE THE

ROYAL COMMISSION ON AGRICULTURE.

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PATNA.

PRESENT :

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

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.	Raja Sri KRISHNA CHANDRA GAJA- PATI NARAYANA DEO of Parlaki- medi.
Sir THOMAS MIDDLETON, K.B.E., C.B.	Professor N. GANGULEE.
Sir JAMES MacKENNA, Kt., C.I.E., I.C.S.	Dr. L. K. HYDER.
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Mr. E. DANBY. Babu A. P. VARMA.	} (<i>Co-opted Members.</i>)
Mr. J. A. MADAN, I.C.S. Mr. F. W. H. SMITH.	

**Dr. J. M. COWAN, M.A., D.Sc., Officiating Director, Botanical
Survey of India.**

**Memorandum on the Cultivation of Cinchona in India and its Future
Development.**

1. *History of Cinchona Cultivation in India.*—The cultivation of cinchona in India has been controlled by the Government of India ever since its introduction in 1860, but the Central Government has entrusted the manufacture of quinine to the two producing Provinces, Bengal and Madras. In 1862, a Government cinchona plantation was started at Dodabetta near Ootacamund and shortly afterwards at Naduvattam, also on the Nilgiris. The Bengal plantations date from 1864. Seeds and plants were brought by Dr. Anderson, Superintendent of the Royal Botanic Gardens, Calcutta, who went to Java to study Dutch methods.

About the same time the cultivation of cinchona was taken up by private planters, and the enterprise was so profitable that there was immediately an indiscriminate rush to plant it, especially in Southern India and Ceylon. A very large area in comparison with the demand at the time was soon under cultivation, with the result that between 1880 and 1890 the market was flooded with enormous quantities of bark and consequently prices dropped. Cinchona cultivation then ceased to be the lucrative proposition that it had been, and planters, finding the cultivation of tea more profitable, grew it in preference to cinchona. Another factor which contributed to the failure of private enterprise was that on the early plantations the species grown were *Cinchona officinalis* and *C. Succirubra*, both of which yield only a low percentage of quinine. Private cinchona growing has never revived and practically the only plantations which survived were those managed by Government, extending in all to about 4,000 acres.

2. *Cinchona Cultivation in Java.*—In Java the relative over-production of bark between 1900 and 1912 threatened the planters there with conditions approaching those which had prevailed in India ten years earlier.

Plantations in Java had, however, been managed scientifically almost from the start and, instead of abandoning cultivation, Java planters formed a combine between themselves and the principal private quinine manufacturers throughout the world. They have now an area of about 40,000 acres bearing cinchona and the quinine derived from the bark is said to represent over ninety per cent of the world's output.

3. *Possibilities of Extension in India.*—In 1916 the Home Government, realising that the British Empire was almost entirely dependent upon a foreign power for its supply of quinine, suggested to the Government of India that they should examine the possibilities of extending the production of quinine to meet the future needs of the Empire. The Government of India accordingly appointed Lt.-Col. Gage, then Director of the Botanical Survey of India, to investigate the possibility of obtaining enough land within the Indian Empire. Col. Gage spent the whole of 1917 in exploration and the results of his investigations are embodied in a report which was published in 1918.*

The general result of this report was the elimination of a large number of areas for various reasons, such as unsuitability of soil, remoteness and excessive rainfall, and the restriction of the choice to three areas, the Mikir Hills in Assam, the Anamalai Hills in South India and the district of Tavoy and part of Mergui in South Burma.

4. *Tavoy and Mergui.*—Tavoy was selected as the best locality and the Government of India commenced planting there in 1920.

In 1923 this plantation had to be abandoned, as the rainfall was excessive and wind storms proved so severe that a large percentage of the plants died. At the end of 1923 the staff was transferred to Mergui and a plantation was opened on a site near the Little Tenasserim river, some 90 miles above the township of Mergui.

Considerable difficulty was experienced with labour and work has so far been handicapped by exceptional periods of drought alternating with exceptionally heavy downpours. Climatic conditions have, therefore, not been entirely favourable and this has necessitated replanting part of the area. Although 520 acres have been planted, the success of this area cannot yet be said to be assured.

Species planted.—It has been noted that the original species planted in India were *Cinchona officinalis* and *C. Succirubra*, both with a very low percentage of quinine. Since 1870 the species grown in Bengal has been mainly *Cinchona Ledgeriana* which yields a high quinine percentage.

A number of hybrids have appeared on the plantations, as the result of natural cross fertilisation, and some of these are found to be well adapted to local conditions, and to be little inferior to *Cinchona Ledgeriana* in their

* Report on the Extension of Cinchona Cultivation in India by Lt.-Col. A. T. Gage, I.M.S.

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yield of quinine. However, until the breeding of profitable strains has formed the subject of research, *Cinchona Ledgeriana* will be the species to be grown when the production of quinine is desired.

5. *Conditions Essential for Growth.*—For the growth of *Cinchona Ledgeriana* and more particularly for its rapid growth, so as to yield a large supply of bark, special conditions of soil and climate are essential. The conditions may be summarised as follows:—

Temperature.—Extremes of temperatures are injurious. *Cinchona Ledgeriana* will stand neither frost nor great heat. The ideal temperature may be taken as about 75° F. with a mean minimum of about 60° F. and a mean maximum of about 85° F. throughout the year. Some variation is permissible, according to the amount of atmospheric humidity, but a high sun temperature should be avoided.

Rainfall.—A considerable variation of rainfall is permissible; the limits are roughly from 75 to 180 inches per annum. Where the soil is porous and well drained 200 inches would not be excessive, but a heavy rainfall combined with a stiff soil is very unfavourable.

Altitude.—The limits of altitude are affected not merely by latitude but also by physiographical conditions. The upper limit, where frosts are absent, may be taken as 5,000 feet, the lower limit as about 1,000 feet. Attempts have been made both in Java and elsewhere to grow cinchona below this level, but they have not met with success.

Soil.—The best results can only be obtained on a rich, porous, well-drained, loamy soil, on moderate to steep slopes. Such soil at the necessary altitude can only be found as the substratum of evergreen forest, and in the Indian Empire only over volcanic or granitic rock formations. Soil impoverished by cultivation is unsuitable.

6. *Factors influencing Cost.*—The above conditions are essential. The accessibility of the area, the means of transport in existence or the means which may be made available, and the possibility of obtaining and settling labour are factors which will determine whether the venture will be financially successful or not.

7. *Available Areas.*—Taking these points into consideration the available areas may be classified as follows:—

(a) South India.

Anamalai Hills.—The largest suitable area in South India is situated in the Coimbatore district on the Anamalai Hills, at an elevation of from 3,000—4,000 feet. This is one of the areas recommended by Colonel Gage, and he estimated that about 10,000 acres could be planted. This is perhaps a conservative estimate. The Government of Madras have already decided to plant this area and operations were commenced in 1925, with a planting programme of 230 acres per year. Some 250 acres have already been planted, mostly with a hybrid of *Cinchona officinalis* and *Cinchona Ledgeriana*, but it is intended to plant a considerable proportion of *Cinchona Ledgeriana* in the future. I have recently visited this area and, although it is too early to judge it by the plantations, they show considerable progress. Elevation, soil, rainfall and temperature are all favourable and the tracts bears evergreen forest with gigantic trees. It gives every promise of success and may be classed as an area on which cinchona growing is likely to be a commercial success.

High Wavy Mountain, Vellarimala and Vavulmala.—It is possible that extensive exploration might reveal a number of small areas in South India where the growing of cinchona would be possible but the probability is that most of such areas are now under tea. Colonel Gage's report served to eliminate other localities where considerable acreages might be available, with the exception of about 4,000 acres on High Wavy Mountain in the Madura district, and 3,000 acres on Vellarimala and Vavulmala, two peaks of the Western Ghats rising to over 7,000 feet. The suitable land in both these localities is remote, transport and labour charges would be high and they could only come under the category of areas where a subsidy would be necessary.

Dodabetta and Naduvattam.—From the original plantations at Dodabetta and Naduvattam, as Colonel Gage points out, little more need be expected; at best they will tide over the time till the Anamalai plantations come into bearing.

(b) *Burma.*

Tavoy and Mergui.—Tavoy has been proved unsuitable and Mergui has not yet been proved a success. In both districts an area of some 400 square miles would have been available.

Namyin Valley.—Further exploration is required of the Namyin Valley, a large tract comprising nearly 5,000 square miles in the north-west corner of the Katha district. It was not considered by Colonel Gage to be compared with Tavoy and records of temperature are not available. It would, therefore, be necessary, after exploration, to test the locality by experimental plots of 50 to 100 acres. Here, as elsewhere in Burma, labour would be costly and difficult to obtain and transport charges would be high, so that, unless a large tract was found suitable, it is probable that cinchona could not be grown except at an excessive cost.

Mogok.—During the cold season of 1925-26 Mr. P. T. Russell, Superintendent of the Plantations at Mergui, was deputed to explore the possibilities of further extensions in Burma. He did not visit the Namyin Valley, but after an extensive tour which, like Colonel Gage's earlier tour, served to eliminate a large number of localities, he recommended Mogok as a suitable locality.

The area in question is situated in the Katha district, south of the road from Thabeikthyin to Mogok, and extends to about twenty-five square miles. Colonel Gage had been led to understand that the soil was a stiff red clay and rejected it on those grounds. The soil, however, as pointed out by Mr. Russell, is a rich loam and would be suitable for cinchona. It has many points in its favour and would be worth trying experimentally. The greater part of the area is, however, at an elevation of less than 2,000 feet and above 3,000 feet frost occurs. Moreover, I find on inspection that the slopes on the better land are frequently gentle, so that, without preliminary experimental work, I consider that it would be unwise to commence operations on a large scale. Although labour would be expensive, transport would be comparatively easy and, if other conditions are not too adverse, cinchona might here be grown at a profit.

(c) *Assam.*

Mikir Hills.—An area in the Mikir Hills, namely, the Kaliani and Mikir Hills forest reserves, situated about twenty miles from the Assam-Bengal Railway, was characterised by Colonel Gage as one of the three most suitable areas in India. It is said to extend to about 20,000 acres of plantable land and the average altitude is about 1,500 feet. This area would probably repay exploration and experimental cultivation and it ought to be possible to make the undertaking commercially profitable.

The Government of Assam have, in 1921 and again in 1925, suggested the establishment of a plantation and factory in the Province, but, owing to difficulties inherent in the enterprise and to the provincial liability with regard to the Imperial reserve stocks of quinine, the Local Government dropped the proposal.

(d) *Bengal.*

The climate of the foot hills of the Himalayas in the Darjeeling district is undoubtedly second to none in India for the production of *Cinchona ledgeriana*.

Mungpoo and Munsong.—There are two Government plantations, Mungpoo, established in the sixties, with about 3,000 acres of suitable land of which about 1,000 acres is at present under cinchona, and Munsong, established in 1900, with about 2,000 acres.

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Mungpoo.—The Mungpoo area could probably produce a larger amount of bark, if a regular system of fallowing were adopted. With a ten-year rotation and allowing the land to be fallowed in turn for a period of ten years, 150 acres could be planted and harvested continuously, whereas for a number of years the harvest has been restricted to about 75 acres, while 100 acres only have been planted.

Munsong.—Munsong plantation is fully stocked and if the land is to be fallowed, as it must be, another area will have to be found to tide over the fallowing period.

The greater part of the suitable land in the Darjeeling district has been for many years under tea cultivation.

East Nar.—I have, however, recently proposed to the Government of Bengal that an area of 4,000 acres of probably the most fertile forest land in the Kalimpong subdivision should be tried experimentally. Here, there is but one adverse factor, a somewhat heavy rainfall. Elsewhere in the Darjeeling district the land available would be scattered, the soil would be of inferior quality, and the total area would amount to only a few hundred acres. This proposal is still under consideration.

8. Results of Investigations.—It will be seen that, with regard to the possibilities of growing cinchona in India, the greater part of the investigations so far made have given negative results. It is also clear that mere inspection of an area, even if some data regarding its climate are known, is insufficient to prove its ultimate merits or demerits as an area for the cultivation of cinchona. The only safe method of testing a likely area is by experiment.

Experimental Work needed.—Many unsuitable areas have been eliminated and it remains now to test the areas where there is considerable hope of success. A period of three years will be a reasonable time for each experiment and plots of 50—100 acres would give sufficient indication of the suitability of the land within a considerable radius.

9. Possible Extensions.—The most hopeful areas are:—

	Acres.
(1) The Anamalais where work has already been begun	10,000
(2) East Nar in Bengal	4,000
(3) The Mikir Hills in Assam	20,000
(4) Mogok in Burma	10,000

TOTAL . 44,000
(approx.)

I do not think there would be an excessive loss to Government in the taking up of any of these areas if, after experiments, the climatic and edaphic conditions are found to be suitable; on the other hand, a large profit might be expected. There is also a fifth area, namely, the Namyin Valley in Burma where a very large tract is available, but little is known as to its suitability. It is, however, worthy of exploration and experiment.

10. Imperialisation Necessary.—In order to carry out the experimental work required, to co-ordinate efforts and to accomplish the work in a reasonable time, I believe it is essential that the subject of cinchona cultivation should be taken over in its entirety by the Central Government. Colonel Hutchinson, then Public Health Commissioner, urged this strongly at a Quinine Conference held in 1923, pointing to the example of Italy. I understand that Colonel Gage and Mr. Calder both urged this proposal and I strongly concur. The necessity of imperialisation was accepted by the Government of India, but as Public Health had become a Transferred Subject by the introduction of the Government of India Act of 1919, the proposal was abandoned. It seems, however, impolitic to leave matters where they stand on merely technical grounds.

If Java with her limited sources could command the quinine market of the whole world, it seems regrettable that the Indian Empire with her vast resources cannot even meet the requirements of her public hospitals and dispensaries.

Concerning this wider subject, the independence of India, as regards its quinine supply, there are further potent reasons for the centralisation of the subject.

Clash of Policy.—Under the present system quinine is produced by two Local Governments. These Governments, from a business point of view, look for profitable returns on their capital outlay. On the other hand, the policy of the Government of India represents also the non-producing Governments. It has, as its ultimate aim, the availability of quinine to the whole of the population with a view to eradicating the malarial scourge.

So far, in spite of all that has been done, the advance actually made is small. Further effort is necessary.

Research needed.—There is, for example, the question of research, an extremely important aspect of cinchona growing, which would be much more easily and economically undertaken by a central department.

Supplies and Distribution.—The question of supplies and their distribution is a problem which is and must be under the control of the Government of India. The present system of distribution, though in part controlled by the Central Government, is cumbersome and difficult and requires a thorough overhaul.

11. *Imperial Cinchona Department.*—The organisation and control of research and of an effective system of distribution, together with the control of the cultivation and manufacture of quinine, requires the full services of an administrative head responsible to the Central Government.

The successful execution of a philanthropic policy involves a great responsibility. To remove clashing interests, and to move forward, with the prospect of attaining in a reasonable time the aim which the Government of India have set before them, will involve more adequate control and a greater co-ordination which can only be obtained when cinchona cultivation and production and the distribution of quinine are controlled throughout the Indian Empire by the Government of India.

Note in Extension of the Memorandum on the Cultivation of Cinchona in India and its Future Development.

Assuming that the demand for quinine will be maintained and that India's object will be to supply her own requirements, it is necessary that schemes for the development of cinchona cultivation should be undertaken without delay.

The present position has been sufficiently set forth in my memorandum, but the need for early action is more than ever emphasised, at least in my opinion, by conditions in Burma.

Experience shows conclusively, both in Bengal and Burma, that large schemes involving the establishment of cinchona over large areas should be preceded by experimental planting in such a way as will allow of further development. Much money can be, and has been, lost through the insufficiency of data available. This may have been inevitable, for certain risks have to be undertaken, but any further considerable extension should be subsequent to, and not precede, real experiment.

The main problem is to find more land.

Small experimental plots of twenty-five to thirty acres, either in block or distributed over a small area will provide really reliable data, and even if such areas are failures, the experience gained will more than compensate for expenditure on them.

So far as exploration has been undertaken three regions stand out as likely to be worth a trial. These are Mogok, in the Katha district of Burma, the Mikir Hills in Assam and a region to the east of the present Bengal

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cinchona plantations. It is suggested that the experimental work should be started first in Burma and Bengal, since for the time being supervision would be more difficult in Assam. The cost of each such area need not exceed ten thousand rupees per annum.

At the same time it is necessary to continue exploration to find other areas, with a view to the possible opening of experimental plots in these also. Experience is ample to show that both exploration and the testing of the land by experiment are necessary. There are likely areas in Madras, where the Local Government is already planting.

The second problem is to increase production from existing plantations.

This may be done in any or all of three ways:—

(a) By increasing the percentage of quinine in the bark.

Although in Bengal the quinine percentage has been doubled in the last two decades, progress in improving the cinchona tree need not stop there. The methods hitherto followed to secure this result have depended mainly on the selection of seed from analysed trees. This method has proved much safer than selection for form and size of trees only. At the same time there is a large field of work awaiting the officer who is out to select and breed. It should be remembered that every unit in the increase of quinine content is equal to an increase of about twenty per cent in the total production. The method is mainly selection, the requirements the requisite staff.

(b) By shortening the rotation.

After bearing, cinchona land in India is, as a rule, fallowed in forest for at least ten years before planting a second crop.

In Java the period has been greatly shortened by grafting *Ledger* with high quinine content on *Succirubra* which has a much sturdier root system. Millions of plants are grafted yearly.

In India this method has been tried but there is much room for further experiment. Suitable manures, particularly green manures, should also be experimented with.

(c) The preparation of working schemes for existing plantations.

To obtain the maximum annual return from a given area, a definite pre-considered planting and harvesting programme is necessary.

The development of cinchona seems to have been made, in the past, subservient to financial and political considerations.

Staff.—For the collateral development of planting and research in cinchona the question of a sufficient staff for both purposes cannot be over-emphasised. The tea, jute and other industries have their own organisations for scientific research. The results obtained by these organisations and the advantages accruing to the industries themselves are examples of what might happen to cinchona if its department were staffed in a manner worthy of its importance.

If over-economy in the direction of scientific officers is and must be apparent, the same is not less true of the purely plantation staff. The officers now in charge have wide divisions to attend to and the ordinary routine work of supervising work gangs leaves them no time for work which might result in permanent improvement. Until a comparatively recent date, recruits for the cinchona departments were obtained through the services of Kew or other horticultural centres in England. In the absence of such centres in India recent recruits have not had the benefit of this training.

Distribution.—Distribution is work which should not occupy the time of officers qualified to do important scientific or administrative works. The present system of distribution would seem to be unnecessarily complicated and could very probably be made easier by adopting a code of commercial accounts. Such a code is already in course of preparation for Bengal.

The proposal to centralise cinchona was first expressed by Sir David Praeger in 1897. In 1921 it stood a strong chance of being achieved could agreement have been reached between the Government of Madras and the Government of India regarding the value of the former's plantations. In my opinion much might have been gained by the centralisation of cinchona

and quinine. One cannot fail to recognise that while Public Health is a Transferred Subject there are aspects of it which intimately concern the Central Government. Malaria is one of them and, for the present at least, the successful controlling of this scourge is dependent upon quinine.

Oral Evidence.

A.3184. *The Chairman:* Dr. Cowan, I think you were a Forest Officer in the Bengal Service?—I was a Forest Officer, and I retired. I was asked to come out again to act as Director of the Botanical Survey of India and Superintendent of the Botanical Gardens, Calcutta. I have just again handed over charge.

A.3185. You are about to retire?—Yes. I am about to retire.

A.3186. And you were for a year and a half Director of Botanical Survey?—Yes.

A.3187. Have you formed any view as to what the probabilities are that India could grow the quinine that India requires if the right places, assuming that they are there, were found and the right policy pursued?—It is a difficult question to answer. I do not think that there would really be any great difficulty in India meeting her own demands if the right places were found; and I believe the right places could be found.

A.3188. I do not wish to tie you down to any exact statement but you think there is every chance that India might be able to grow all the quinine that she requires?—I think there is every chance.

A.3189. Have you studied the Java plantations?—I have not been to Java. I have read a little about them, but I am afraid I do not know a great deal about them.

A.3190. Do you know what is the net profit per acre there? Is it very considerable?—I imagine it is fairly considerable but I have no definite data. I do not exactly know what the actual profit is.

A.3191. It is a fact, I think, that the factories working in India are able to put the quinine as a finished article at the disposal of Government at a considerably lower rate than that charged by the Java concerns?—That is a fact, certainly.

A.3192. Is it reasonable to suppose that, if suitable areas could be found and the right policy pursued, quinine might be produced in India at a cost considerably cheaper than the present world price?—Yes. The bigger the area and the greater the quantity to be manufactured, the lower the cost.

A.3193. That would mean that there would be large quantities of quinine in India at a rate cheaper than the world price?—I do not know whether much could be done in the direction of lowering prices until India is in a position to supply her own needs. If the selling price is below world prices there will be an immediate export of quinine, possibly even in spite of legislation.

A.3194. Do you think it likely that if India were in a position to supply, let us say, seventy-five per cent of her requirements of quinine she could supply that seventy-five per cent at a cheaper rate than the world price charged by the Java concern without that world price coming down to the level of the Indian-grown quinine?—Do you mean the whole demand or the Government demand, because we supply only the Government demand? We make no attempt to supply the whole of the Indian demand.

A.3195. I quite agree. What I am thinking of is this: If you have large quantities of quinine in the hands of Government and have it distributed throughout the country by Government agency and have it sold to the rural population at a rate below the world price there would, of course, be the risk that that quinine might, instead of finding its way into the hands of the cultivator at cheap rates, be exported from the country and sold at a profit!—There will be grave risk of that happening. It is practically certain that that would happen and there would have to be legislation to prevent it. I probably could be prevented largely by legislation.

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A.3196. Have you examined the problems of distribution?—To some extent I have examined them.

A.3197. Do you think it conceivable that a sufficiently efficient and economical system of distribution could be devised to make it possible to place quinine in the hands of the cultivators at prices much below world prices?—I think that it should be quite possible to do so through the post offices or other institutions. Recently, in Bengal, an arrangement has been made under which union boards sell it as well.

A.3198. Can you give the Commission any idea as to the minimum period of time which must elapse before any important part of the quinine required by Government agencies in India could be supplied from Indian plantations?—I think that at present there is little prospect of supplying any large quantity of quinine from Government of India plantations.

A.3199. You mean, unless new ground is found?—If new ground is found, then it will be a matter of eight or ten years until supplies will be ready.

A.3200. Eight to ten years?—Yes. The cinchona takes eight to ten years to grow and the position is that before new land is taken up, in my opinion, experiments ought to be made so as to ensure success. These experiments will take at least three years and then it will take about ten years more for the quinine to mature.

A.3201. Making allowances for disappointments, do you think twenty years would be a reasonable period?—It should not take more than that.

A.3202. Have you any views as to the proper policy to be pursued in relation to the Java contract which, as you know, is about to expire?—In my opinion it would be well if it were renewed.

A.3203. If the centralised policy that you advocate is to be adopted, would you like to see the Central Government take over the factories?—Yes, I think it would be a good plan.

A.3204. Would you like the Central Government to take over these factories at an early date or would you rather wait until large quantities of Indian-grown quinine are available?—I think it is extremely important that the plantations should be taken over at an early date. I think it would be well if the whole quinine question were centralised. I have not really thought of the point as to whether it would be advisable to take over the factories alone.

A.3205. Does the case for centralisation lie in the fact that quinine can only be produced in a few Provinces but it is required in all?—That is the chief reason. There is also the work of co-ordination and research which could be more economically done if it were undertaken by the Central Government. Distribution, too, would be simplified under a centralised scheme.

A.3206. In fixing your contract, if it is renewed, you would have due regard to the probable production in India of quinine?—One has to take that into consideration.

A.3207. Is there a deliberate limitation of output in Java?—I believe so.

A.3208. Are you for Government taking the growing of quinine into its own hands or would you favour Government subsidising private growers?—I think both methods might be tried. A great deal might possibly be done in some Provinces by giving subsidies to private growers. A good deal of land which is suitable for cinchona has been taken up by tea planters. If subsidies were given, cinchona might be grown as well. I think, however, Government will mainly have to grow cinchona itself but there is no reason why the other method should not also be tried.

A.3209. I have Lieutenant-Colonel A. T. Gage's report before me. Was his survey comprehensive?—It embraced most parts of India and was pretty general. He came across many big areas which, as far as one could judge from appearance, would be suitable. He specially recommended three, of which two are being tried to some extent. One is the Anamalais in Madras. The other is in the Tenasserim district in Burma, and the third, which is in Assam, has not yet been tried.

A.3210. Does that survey show a sufficient number of likely areas, so far untested, to justify your optimism?—I think so. There are a good number of places where experiments might be made. It is an extraordinarily difficult thing to say whether a particular locality is suitable or not for cinchona without actually testing it experimentally, but we know of about ten places which could be tried and which are at least hopeful.

A.3211. Do you know of any reason why Indian quinine should not compete successfully with the Java product?—I think we are not producing quinine of such good quality. It is not perhaps so pure but in Bengal at least they are now making arrangements to make a purer product. I think it is a question of the cost of manufacture. At a slightly increased cost, a purer product can be produced. There is no reason why, in India, the product should not be as good as it is in Java. It will be slightly more expensive to produce because in India we have not so far been able to get so high a percentage of quinine from the bark, but I do not see any reason why the product should not be as good as the Java product.

A.3212. Do you know of any other areas in the British Empire where quinine could be grown?—I believe that in what was known as German East Africa there are certain plantations.

A.3213. Are they growing it in East Africa?—I believe they are, but not to any very great extent. I think that is the only place outside India in the British Empire.

A.3214. Quinine is an Imperial problem, is it not?—Yes, it is: attempts have also been made to grow quinine in Malaya.

A.3215. Assuming again that your plan of a central administration is adopted, would the immediate planting of experimental plots in likely areas and the proper care of those plots and, at the same time, the setting up of a small but efficient central research station, satisfy your ideal?—In addition to that one would require sufficient staff, because it is a question, largely, of an adequate staff to carry out the research work on the existing plantations.

A.3216. You want your two types of research work, I take it?—Yes. The most important is, I think, the work on the plantations, for which one really requires the requisite trained staff.

A.3217. Do you think that a good deal might be done by selection in the first place and by hybridisation thereafter?—Yes; we ought to select and when we have selected we ought to have our seed nurseries in plots remote from existing plantations. At present we have a good deal of cross-fertilisation; we do not get good strains.

A.3218. Do you take the view that the matter is in the hands of the proper department at the moment, namely, the Botanical Survey?—When quinine was first introduced into India it was introduced by the Superintendent of the Botanic Gardens who is also Director of the Botanical Survey. I think that there would be no advantage in transferring it to another department.

A.3219. I am not quite sure that that is a very good reason for leaving the matter in the hands of the Botanical Survey; the alternative would be, I suppose, the Forest Department?—Yes, but it would then become a secondary subject to forestry. If a man has got to deal with several widely differing subjects it is rather difficult to get him to concentrate his full attention on one particular subject. It would be advantageous to make quinine a special subject.

A.3220. Did things work smoothly between the Botanical Survey and the Forest Department?—Yes, judging from my own experience.

A.3221. You have had no difficulty in fixing these areas, clearing them and so on?—The Botanical Survey did the general clearing, but perhaps the Forest Department might possibly be asked to do that work.

A.3222. *Sir Thomas Middleton*: Does the Forest Department aid the Botanical Survey by drawing attention to suitable localities for cinchona?

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growing?—We have had a considerable amount of help from the Forest Department in directing us as to where cinchona is likely to be successful.

A.3223. I suppose there is a standing arrangement so that they always report such areas?—There is no standing arrangement.

A.3224. Is there a personal arrangement between yourself and the forest authorities?—The position is this: when an officer is sent to explore the first thing he does is to go straight to the head of the Forest Department and then he gets help from that officer as well as from the Divisional Forest Officers.

A.3225. What work is the Botanical Survey now carrying on in the field?—It is chiefly carrying on cinchona work. The cinchona work is so heavy that there is little actual botanical survey work being done.

A.3226. In your note with regard to soils you mention two different types of soil, volcanic and granitic, as being suitable for cinchona?—Yes, sandstone and limestone soils are definitely unsuitable.

A.3227. It has been stated somewhere that one species, I think it was *Cinchona Ledgeriana*, was restricted closely to volcanic soils?—*Ledgeriana* is rather more fastidious than the others, but the chief difference between the requirements of the various species is the elevation. *Cinchona Ledgeriana* will stand neither frost nor great heat. As I have said in my note the ideal temperature may be taken as about 75° F. with a mean minimum of about 60° F. and a mean maximum of about 80° F. throughout the year. The limits of altitude are affected not merely by latitude but also by physiological conditions.

A.3228. You mention the Anamalais as one of the most promising areas for cinchona, and you mention the possible competition of tea. In that region does not tea occur mainly above the 3,500 ft. level?—The Madras Government have reserved an area of something like 23,000 acres for the growing of cinchona; elsewhere practically all the suitable land has been taken up by tea-gardens, or has been asked for by tea concerns.

A.3229. At the 3,000 ft. level, planters would probably grow coffee, and in some cases rubber?—There is a good deal of tea round about the actual cinchona plantations.

A.3230. *Mr. Calvert*: All those areas which have been marked out as suitable for cinchona are mostly Government reserved forests, are they not?—I think all of them are.

A.3231. *Dr. Hyder*: With regard to making this survey more accurate, do you think that it would be a good policy if the Government of India were to request the forest departments of the Local Governments to make a more detailed survey?—Yes, I think the forest departments might certainly help in that respect. But after the Forest Department had suggested a possible site or sites, it would be necessary for somebody with actual experience in cinchona growing to visit the sites before anything further was done in the matter.

A.3232. The only tropical territory under the direct control of the Central Government is the Andamans. Have you considered the Andamans?—Colonel Gage, I think, mentions the Andamans in his report as one of the areas that would not be suitable.

A.3233. *Sir James MacKenna*: In view of the fact that the efforts of the Botanical Survey are now, as you say, practically entirely devoted to cinchona, do you not think that there is a strong argument for a separate department so that the Botanical Survey can get back to its legitimate work?—Yes, I think so.

A.3234. Do you think that an expert botanist is the best officer to select an area for the cultivation of the cinchona plant?—I should think that the man who has had a good deal of experience in growing cinchona would be the best man to do it.

A.3235. I wonder if Colonel Gage consulted the Burma Government when he selected the two areas of Tavoy and Mergui?—Yes, I think he did; I think the Forest Department advised him.

A.3236. What are the chief adverse factors in Burma?—One of the chief adverse factors in Mergui is the very hot sun and there is a tremendous difference between the sun temperature and the shade temperature.

A.3237. *The Chairman:* Do you wish to say anything else?—Nothing, except that I should like to emphasise the need for taking measures soon because I think there is danger of the supplies in India falling off; if the measures I have suggested were taken in hand soon, there would be no danger of a serious drop in supplies.

A.3238. Consumption varies very much according to the price, does it not?—The effect of the recent fall in the price has not been shown so far by an increased demand. The price recently fell from about Rs. 25 to Rs. 18 in 1926.

A.3239. Consumption has not responded to that?—Not at all, practically.

(The witness withdrew.)

Dr. J. M. Cowan.

Thursday, December 1st, 1927.

DELHI.

PRESENT:

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

Sir HENRY STAVELEY LAWRENCE, K.C.S.I., I.C.S.	Raja Sri KRISHNA CHANDRA GAJA- PATI NARAYANA DEO of Parlaki- medi.
Sir THOMAS MIDDLETON, K.B.E., C.B.	Professor N. GANGULEE.
Sir JAMES MACKENNA, Kt., C.I.E., I.C.S.	Dr. L. K. HYDER.
Mr. H. CALVERT, C.I.E., I.C.S.	Mr. B. S. KAMAT.

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

Dr. J. T. EDWARDS, D.Sc. (London), M.R.C.V.S., Director, Imperial
Institute of Veterinary Research, Muktesar.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(a) *Suggestions for the better organisation, administration, and financing of veterinary research.*—(1) So far as concerns the institute of which I am Director, I am afraid I cannot convey adequately to the Royal Commission an impression of the manner in which betterment can be effected unless it is prepared to accompany me on a tour of inspection around the institution.

(2) Since the Muktesar Institute was started in 1895 (after the appointment in 1890 of the Imperial Bacteriologist, a designation now changed to Director of the Imperial Institute of Veterinary Research) merely as a small station for research into animal pathology, its activities have gradually developed into those of a large-scale "factory", the main function of which is compliance with the needs of the Provinces by the manufacture of certain products (chiefly rinderpest serum) for combating animal disease. It is no fault of the direction that the institution has not developed otherwise, for the nature of the demands made upon it has inevitably tended to make it assume the aspect of a factory, and, as such, for efficient working it must needs have the organisation, administration, and financing of a well run factory. Steps have now been commenced in close consultation with my controlling officer and the audit authorities to have the institution—so far, at least, as concerns its manufacturing side—organised in this manner, and it has been submitted that this organisation connotes complete commercialisation, according to the systems now recognised by the finance and accounts authorities, with considerable strengthening of the staff for purposes of supervision of factory management, accounts, and internal economy.

The recommendations of the Inchcape Committee (1923), that the institution should be run on a self-supporting basis, are responsible for this development to some extent, in so far as Government implied, at least, in a time of financial stringency, that they should be adhered to afterwards. But, for the most part, the development has been the natural outcome of the services

demand of the institution by the Provinces, which have taken the very concrete form of requisitions for products of known efficacy to combat the serious contagious diseases of cattle.

(3) The kind of research prosecuted in the institution has been very largely, during recent years, connected with improvements in the manufacture of the above products, and the present favourable financial position of the institution, when it has well exceeded the ideal of self-support, is attributable largely to the organisation of research to this end, with the result that it has become possible to undertake manufacture on a much larger scale than was believed possible a few years ago and effect considerable economies in the processes of manufacture. It is submitted that the costs of this class of research ought to be set off against the revenues of the institution and computed in the scheme of commercialisation.

(4) There have been, in addition, during recent years a number of research projects taken up by the institution which have no direct relationship with our issues of saleable products. Examples are:—(a) researches into the treatment of surra in horses (the outcome of which has been the recommendation for use of a certain drug made by a certain firm of manufacturers, to be administered in a certain way); (b) researches into the incidence of tuberculosis among livestock, especially cattle in India, with investigations into the relative susceptibility of Indian cattle and the virulence of the tubercle germs found in diseased cattle in India; (c) researches upon certain important blood parasites (piroplasms) and intestinal parasites (coccidia) of cattle; (d) attempts to cultivate the germ of rinderpest in cattle; (e) researches upon contagious abortion and Johne's disease in cattle in India.

It is submitted that the costs of researches of this kind cannot, with complete fairness to our customers, be charged to the revenues of the institution. It may be reckoned perhaps that the adverse balance in the accounts of the institution calculated from its inception may be taken as the cost to Government of this class of research, if we do not allow that during very recent years it has been conducted at the expense of our customers. It may be argued, again, that it is our customers who benefit entirely from the research and that they pay a toll on the products they purchase from us for the work performed at the institution to advance their knowledge generally on animal disease.

A more equitable arrangement would seem to be for Government to contribute such lump sum as it thinks fit for the prosecution of this class of research. As results in research cannot be guaranteed and as the progress and method of expenditure depend upon the indications that arise in the actual prosecution of the research, the work should not be jeopardised by making it comply with the procedures of accountancy systems in the expenditure of the sum.

(5) Suggestions of a general kind.

(a) Attention is invited to the following authoritative statement:—

“*The Overseas Empire.*”

“(5) It has been impossible in the time available to obtain evidence with regard to the facilities existing throughout the Overseas Empire, but an account is given of the provision made for veterinary research in India and South Africa. In India immense opportunities are almost wholly neglected; in South Africa there is a model organisation for the study of animal diseases. Leaving out of account the work done in South Africa, the state of research into animal diseases within the Empire is at present lamentable in relation to the opportunities available.”*

The statement needs some criticism, however, and I submit as an appendix a memorandum† drawn up recently at the request of my higher authority.

* *Development Commission. Report of the Advisory Committee on Research into Diseases in Animals. 1922. London: His Majesty's Stationery Office.*

† Not printed.

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ties for presentation before the proposed “Conference on the Co-ordination of Agricultural Research throughout the British Empire to be held in London in October 1927,” showing the achievements of research in India, and the prospects for future expansion.

(b) Briefly, in my opinion, the improvement in the organisation of veterinary research in India connotes attention to the following requisites:—

(1) *Trained workers.*—Hitherto, the only officer recruited on the condition that he must be “a first class veterinary pathologist” has been the Director of the Imperial Institute of Veterinary Research, Muktesar (*vide* Secretary of State's advertisement calling for applicants for the post). It is presumed that the rate of emoluments and the prospects offered were sufficient, and just sufficient, to attract a man whose qualifications would conform with this designation. It is plain that if more first class men, already well trained in research into animal disease, are required to meet the needs of the country, measures ought to be taken to increase the recruitment of men on the same basis, provided such men are available in the market and can still be obtained on this basis. I am somewhat doubtful, however, concerning the ready availability of men of the kind, and the recent action of the Secretary of State for the Colonies tends to corroborate my belief. (*Vide* The *Veterinary Record*, Vol. VII, No. 43, p. 945.) The market, at the present time, would have to be widened to international or, at least, Empire-wide limits to make a selection of men who would conform with “first class” considerations. I would like to argue this matter further with the Royal Commission.

At Muktesar, during recent years, endeavours have been made to train Indians in India (classes for the training of selected provincial officers—two years course—to fill the highest ranks in the service; training of subordinate officers for short periods; apprenticeship of veterinary graduates recruited of the staff in research methods). These efforts must needs have encouragement, and in the course of time it is not unlikely that they may be fruitful of producing men well qualified to undertake independent research: they have already produced good assistants.

(2) *Education.*—The veterinary colleges in India produce subordinate veterinary officers to undertake certain classes of work under direction in the field. The monetary inducements of these services are so low that it is most unlikely that men with the requisite basic training in general knowledge and the natural sciences will enter the colleges, and on emergence possess a sufficient competence to add to it a superstructure of training in the difficult subject of research into disease. Some of the colleges are admirably equipped as regards buildings and material. The equipment in teaching personnel is, however, often of low quality; there is no uniformity in the systems of examinations; the standard of knowledge attained by the students is, for the most part, lamentably poor.

It is suggested that for the eventual development of research organisations within the country, prime attention should be paid to the veterinary educational facilities within the country, and again in the first place by the recruitment, from whatever source they are obtainable, of first class men to the teaching staffs, so that the basic sciences—anatomy and physiology, and pathology, hygiene, genetics and preventive medicine are well taught to the men who are destined to come into actual contact with disease in the country.

It is further suggested that a central standing advisory committee should be established to deal with veterinary education. The attention of the Royal Commission is particularly directed in this respect to the recommendations of the “Second Meeting of Veterinary Officers in India,” held at Calcutta from the 26th February to 2nd March 1923, upon which Government has not yet taken action.

The needs of India, as they now are, differ fundamentally from those of Great Britain in veterinary personnel. Whereas in England the general public needs overwhelmingly a man of the practitioner type, to treat, or assuage the mind of the owner of, animals suffering from clinical or sporadic disease, the need of India is almost entirely for salaried officials to enter a

State service, and the type of disease that concerns the State is the contagious kind (epizootic or enzootic) that tends to affect the general community, and not so much the clinical case that affects merely the individual owner. Hence, in any scheme of veterinary education, attention ought to be paid in the first place to turning out men well qualified in State veterinary medicine (epizootiology, hygiene, dietetics, genetics, general and special pathology). In Great Britain, there exists a Royal College of Veterinary Surgeons responsible to the Privy Council for training men who, on emerging from the teaching institutions, bear the designation "veterinary" to indicate to the public that they bear a certain standard of qualifications. As in India the graduates of the veterinary colleges become almost entirely Government servants, it is for Government to demand of them whatever standard or kind of qualifications it wishes. In recent years special facilities have been accorded in some of the British veterinary colleges to certain students who aspire to proficiency in research in animal pathology, notably by the institution of courses for degrees in veterinary science which are granted by the neighbouring universities, and by the establishment of post-graduate courses in State veterinary medicine. However, it would seem that the main demand on the colleges for a long time to come (as is indicated by the present staffing of the Royal Veterinary College, London) will be for men of the practitioner type.

It is therefore urged that steps ought to be taken in India to foster veterinary education, with the ultimate object of meeting the needs of its field services and research organisations, by developing within the country teaching institutions capable of teaching up to the highest standard of present day knowledge in veterinary science, to meet the peculiar needs of the country. It is not to be expected that any real advance will be made by the sporadic deputation for training, to the European veterinary colleges, of young Indians who possess certain stipulated qualifications but whose aptitude, on the attainment of maturity, for practical work in scientific research or field endeavours is entirely problematical.

It is recommended therefore that steps be taken early to institute systems of primary veterinary education in the various colleges in India and Burma that will attain at least the standard of that laid down in the "Report of the Meeting of Principals of the Indian Veterinary Colleges," held at the Bombay Veterinary College on the 8th to the 10th February 1922.*

Further, provision ought to be made for the training of graduates who show a distinct promise or capacity for research at centres (Muktesar, or any such centres that may be established in future) by prolonged apprenticeship as assistants to the expert personnel that ought to be found on the staffs of such centres.

(3) *Co-operation with the field or administration veterinary services.*—Although there is open an enormous field for research into the animal diseases of India, there is sufficient knowledge already available, as the outcome of research, to eradicate or bring under effective control, within a measurable period of time, the most serious contagious diseases of cattle in India, if the field veterinary services available for applying this knowledge were adequate in numbers and competence, and if they were sufficiently empowered by legislative enactments to apply the measures that are indicated for control whenever and wherever they need application. This statement refers particularly to the diseases, rinderpest, hæmorrhagic, septicæmia, black-quarter, and anthrax.

The chief impediments are that the veterinary services in the Provinces are grossly understaffed to undertake this class of work; the time of the higher officers in the services, it seems, is taken up with the kind of general administrative work which attaches to any Government service and not in technical administration or executive work, and there is no legislative machinery whatever available to command the application of rational measures for the control of the more formidable diseases.

* (Appendix to the Report of the Proceedings of the Second Meeting of Veterinary Officers in India, 1923).

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A letter was received by me a few years ago from one of the most senior officers of the Veterinary Service which illustrates the degree to which these officers at present are able to come into actual contact with disease problems in India. The purport of his letter was that he advised me not to seek information on the subject under correspondence, namely, the protective powers of the serum-alone method of inoculation against rinderpest—the most widely practised method of animal disease control in India—from the Superintendents in the Provinces as they rarely get an opportunity of coming into contact with disease.

In March last, I received a visit from the Deputy Director of Veterinary Services in Kenya, and the impression he got after his brief stay was that the Veterinary Service in India was over-administered.

The services rendered by the few officials who have had charge of the field veterinary organisations in India in the past have, in my opinion, been immense when viewed in the light of the magnitude of their tasks. The provision of a highly proficient and sufficiently numerous technical personnel for the field services is, to my mind, at the present stage of veterinary development, at least as important as consideration of expanding the numbers of laboratory workers, for without an expert personnel well versed in technical field administration, it becomes impossible to reap any advantages from the disclosures of the laboratory workers.

(b) Cases of this kind are almost innumerable, in the present state of veterinary organisation in India. Specific examples are the following:—

(1) *Rinderpest in cattle.*—Hitherto this disease has been combated on a large scale by the inoculation with serum-alone, in the scene of actual outbreaks, of the cattle likely to become infected. The method has the great disadvantage that the immunity conferred is ephemeral. A much better method is known, for the protection of cattle at any convenient time, when a visitation is not immediately impending, by conferring upon the cattle a very prolonged immunity, of some years duration, by means of the so-called serum-simultaneous method. This method has been practised on a considerable scale hitherto only in Mysore State, with most encouraging results. During the last few months, a method has been discovered of cleansing the "virus," by ridding it of the parasites that may give rise to red-water and other diseases, so that it is hoped that the method can be readily practised on a large scale in the field in future, with the minimum of danger. So far as I am aware, there exists in none of the Provinces an organisation specially trained for the application of this protective method, although, economically, the establishment of such organisations would be fraught with untold gain to stockowners. In the past, the prejudices of the owners have acted as a serious impediment to the institution of any method of this kind, but with the existence of special organisations for the purpose, and demonstration of the relative safety of the method, it is believed that owners would be convinced before long of the utility of the method.

(2) *Despatch of serum.*—Serum has hitherto been despatched to the scene of inoculation in the liquid form, and in this state it is often difficult of expeditious transport to the remote localities where it is required. This is a factor of great importance as we know that the success of serum treatment depends, in large measure, upon the rapidity with which it is applied in treatment. Preliminary researches have been carried out at Muktesar which indicate that the serum retains its qualities after it has been much reduced in bulk by drying, in a special manner, to powder form. Further researches are being held up pending the sanction of Government to the appointment of an expert Biochemist capable of investigating the factors necessary for satisfactory and economic drying on a large scale.

- (3) Many projects have only been touched upon in the laboratory, by members of the staff who have to devote their time to groups comprising several projects. Examples are abortion, hæmorrhagic septicæmia, the piroplasmoses, coccidiosis, the cultivation of the rinderpest virus, worm diseases, etc.

(c) Most of the large subjects for research in animal disease have been investigated partially, but a great deal remains to be done. Examples of classes of research which need investigation are:—

- (1) Plant poisoning—almost untouched.
- (2) Dietetics, especially in relation to animal diseases. Questions relating to mineral deficiency and other factors, so far as they relate to the possibility of Indian foods causing nutritional disturbances, form almost a virgin field for research.
- (3) Worm diseases. Observations at the laboratory indicate that a degree of infection with worm parasites exists among Indian livestock, capable of causing untold losses to stockowners. There is here an enormous field for research by a large body of workers.
- (4) The specific contagious diseases. The amount of knowledge available on certain diseases, such as three days' sickness in cattle, *kumri* in horses, is almost negligible. There remains a very large amount of work to be done on the major diseases, concerning which we have already got some information.

QUESTION 4.—ADMINISTRATION.—(a) With the relegation of the Veterinary Service to the category of Transferred Subjects there is no co-ordination of the activities of the services in the several Provinces. So far as they have wished it, the officers of the services have always received technical advice freely from the Muktesar Institute, and it is noteworthy that the demands made in this respect by some Provinces exceed those of others. Among the services in the various Provinces there would appear to be no effort made at co-ordination; the service of each Province tends to become a self-contained organisation, and the anomaly is evident of young officers relegated to the charge of veterinary matters in large Provinces while in smaller Provinces the work is directed by older, experienced men.

There is also the consideration that the great animal scourges of the country are *prima facie* All-India problems, and are such as would be brought under Federal or State-wide control in more advanced countries.

It is therefore submitted that the subject of epizootic cattle disease in India ought to be made a central subject, so that action can be taken to deal with it in the only satisfactory manner possible, by the application of uniform measures of control over the largest possible geographical territory without reference to political or other demarcations.

The subject of clinical or sporadic disease, to which at the present time a large part of the attention of the Veterinary Service is devoted, is, as has been argued at the beginning of this memorandum, in reality no concern of the State, and hence the control of dispensaries or other institutions where treatment of this kind is undertaken might be left to Local Governments to carry out as generously as they think fit to gratify the needs of private owners.

The attention of the Royal Commission is again invited to the Report of the Second Meeting of Veterinary Officers in India (1923) on this matter.

Centralisation of epizootic disease would connote (i) the establishment of a highly efficient central organisation, with a Director General in charge, to assure the effective execution of methods of control throughout India; (ii) the enactment of a Diseases of Animals Act, with certain diseases to be scheduled thereunder, as an instrument empowering the organisation to apply the methods of control; (iii) drafting of regulations for the control of the several scheduled diseases, which would be of obligatory (preferably) or facultative adoption in the Provinces; (iv) subordination of the provincial services, within the ambit of the Act, to the central organisation.

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I have discussed this subject with certain of my colleagues and while there is, in the minds of many, considerable apprehension that the time has not arrived in India when animal disease can be made the subject of legislation, there is also an understanding that no really effective means of bringing about the control can be obtained except through it, and I have also gathered that the antipathy of owners, which is by no means a phenomenon peculiar to India, would be overcome in the face of such measures as a *fait accompli*.

QUESTION 15.—VETERINARY.—(a) So far as the Muktesar Institute is concerned, it is presumed that this question would refer to the Agricultural Adviser to the Government of India and it may well be discussed in conjunction with the question under sub-heading (i).

These questions are not susceptible of easy answer, although I am sensitive that there is abroad, among my colleagues in the Veterinary Service in India, a good deal of strong feeling upon them. This feeling is intelligible, for the subordination of the Civil Veterinary Department to a Director of Agriculture seems to mean in practice the relegation of officers possessing certain standard professional qualifications, in themselves not far short of and resembling those possessed by a qualified medical man, to a position of inferiority as compared with an officer whose credentials on entering his service are the possession of some kind of qualification or diploma in any one of the medley of sciences (such as soil chemistry, botany, mycology) which go to form the very composite contributions to the formation of the modern development known as the science of agriculture. Perhaps, such resentment would not be felt if the Director of Agriculture were of the type that has taken a traditional lead in practical agriculture, based on intelligent and often hereditary empiricism, in England, and has often consisted largely of noblemen and landed gentry. The submission of technical projects for approval or scrutiny to an official trained in another pursuit, who does not necessarily possess any superior capacity for purely administrative judgment such as would be possessed by a trained civilian officer, would therefore tend to be irksome to the higher officers of the Civil Veterinary Department.

There is also an impression abroad that the Government of India requires a mass of veterinary advice for which it must needs at present consult, through the Agricultural Adviser, the senior veterinary officer now directly employed under it, namely, the Director of the Muktesar Institute. This impression is not in accordance with actualities.

At the present time, veterinary subjects are transferred entirely to the control of Local Governments, with the exception of the Muktesar Institute which has remained under the Central Government. It is therefore hard to see what would be the functions of the Superior Veterinary Officer, unless certain activities were created for him, or unless a post of the kind were brought into existence for occupation by an officer who had rendered long and meritorious service, and there is little doubt that some consideration of this kind would stimulate the enthusiasm of members of the department. He might serve some useful purpose also by acting as a liaison officer between the Muktesar Institute and the Government of India, and from long association with the country might be able to furnish the Director of the institute with good advice upon the conduct of the more humble tasks incident upon the prosecution of the functions of the laboratory. He would be in a somewhat invidious position in so far as he had no authority over the heads of the veterinary services in the several Provinces, however welcome he might be at Muktesar.

If no such appointment is created, and it is recognised that the only authoritative work for the appointment, as things stand, would be to connect up the Muktesar Institute with the Government of India, it will be enquired whether the Agricultural Adviser cannot fulfil these functions adequately. It would certainly display lack of gratitude on my part to disparage the endeavours of the two successive Agricultural Advisers who have been my controlling officers since my advent to the charge of the Muktesar Institute. Further, it must be admitted at once that veterinary science must always be the handmaiden of agriculture. I can see no other adequate reason for the prosecution of the science, unless it be as comparative pathology, for

the elucidation of the general problems of disease, or for the acquisition of knowledge for the treatment of subjects that have merely an æsthetic or sporting value. In its general aspects, particularly in regard to the training required to attain proficiency in it, veterinary science bears the closest resemblance to medical science, although in its application it presents many fundamental points of difference. In practice, it has been found too that it is fatal to subordinate veterinary matters to medical authorities, and so if veterinary matters are considered to form a tributary subject, they should be tributary only to agriculture, or to the interests of the great agricultural community in their widest sense. So far as the control of the Muktesar Institute is concerned, it has succeeded well under the present system, if it is viewed as a commercial concern run at a profit or as a place for research, although it is easy to see how matters could be improved and the activities of the institute much expanded.

For progressive development, with the initiation of any really effective measures of control for animal disease, I have submitted, however, in a preceding section that it is essential to centralise the control of contagious animal disease, and appoint a Director General to assume responsibility for the general conduct of operations. If this view prevails, it would naturally follow that control of research organisations would pass over to the Director General, who would direct the heads of the organisations to prosecute such research work as he considered most necessary to meet the needs of the field workers also under his control. It seems to me that the only satisfactory solution of control resides in the organisation of veterinary work along these lines.

Again, in view of their close connection, I would submit that the subjects considered under Part III of the Questionnaire ought to be closely linked together. These subjects deal with the great livestock problems of the country—animal husbandry, veterinary, dairying—and form a group which can be well differentiated from the rest of the agricultural subjects. It is of interest that there is a tendency in the newer veterinary colleges of the world to teach these subjects as a composite group, and it is also noteworthy that in developing his scheme for a new veterinary college, on a commendable scale, at Patna, the Director of the Civil Veterinary Department, Bihar and Orissa, has propounded a system of teaching on these lines.

The conception of linking up the subjects in this group would connote, for Governmental control, the establishment of a somewhat composite organisation under a Ministry of Agriculture somewhat analogous to that which exists in the United States of America and is known as the Bureau of Animal Industry. There would be under the head of such an organisation (a) a Director of Animal Husbandry and Breeding, (b) a Director General of the Veterinary Services, (c) a Director of Dairying (fulfilling the somewhat extended functions of the present Imperial Dairy Expert). To a large extent, the divisions other than the veterinary one represent matters for All-India investigation and control.

So far as I can see, therefore, satisfactory answers to the above two questions are to be found only by creating organisations to deal with the actual problems of the livestock industry of the country, and not by giving primary consideration to the relative precedence of officers in existing departments.

(d) I have ventured to suggest replies to this question within the answers given in the foregoing sections.

(e) Steps have been taken in recent years, at the Muktesar Institute, to comply with all large demands for serum by the despatch of consignments, to meet the requisitions (usually received by telegram) in full, within an average period of five days from the Institute. In cool storage, the serum will keep for at least a year, and our customers are advised to lay up reserves to meet the anticipated requirements of six months ahead (but not longer), so that none of them ought to have much difficulty in keeping sufficient stocks at their headquarters to meet any emergency.

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(f) A few years ago, a Province that was one of our largest customers in serum, and even contemplated instituting a special serum factory in its neighbourhood, resorted, on the advice of its veterinary authorities, to a policy of charging owners a fee for the inoculation of cattle with serum. The demand fell off abruptly to almost negligible proportions. As the protection of an animal against rinderpest by serum inoculation has for its object not only the saving of the life of the animal itself but also the elimination, by preventing multiplication within the animal of the disease, of a potential source of massive propagation of infection, the inoculation ought to be regarded as an operation conducted in the public interest and not charged to the unfortunate owner of actually diseased animals.

(g) I have endeavoured to deal with the question of research, in the general bearings, in my replies to Question 1. The field for further research into animal disease in India is immense, and I would submit that facilities ought to be provided for undertaking research both by extension of the Muktesar Institute and by the setting up, or extension of, provincial veterinary research institutions.

The Muktesar Institute is admirably situated for research into certain general problems, notably into the great epizootic and enzootic diseases which have an All-India significance. Its isolated position and the topography or the surrounding country render it possible to conduct research on the highly contagious diseases: there is abundance of suitable animal material in its neighbourhood for the researches that chiefly need execution, and its temperate climate renders possible researches with bacterial agents of disease throughout the year. Its inaccessibility is to some extent a limiting factor, but with proper methods of collection of morbid material the delay in transmission is not a factor of great importance.

However, there remains a multitude of problems for solution that ought to be investigated by trained local workers. It would need expansion of the Muktesar Institute to an extent that could hardly be measured, and most likely could not be attained, for it to cope with all the problems that arise in the Provinces. Staffs are required locally to examine materials (such as blood smears) forwarded by subordinate field workers to assist them in their correct diagnoses. There are many problems, again, which have a local significance, or which should be investigated immediately at the scene of their occurrence by expert personnel situated within easy reach. Information is very much needed upon certain large problems, such as the piroplasmoses and the worm diseases, which can only be satisfactorily obtained by concatenating the results of a number of experts working at local centres.

The difficulty at the present time resides largely in the paucity of skilled research workers in India who could conduct investigations at the local centres. With the establishment of such centres, the Muktesar Institute, with its larger, skilled staff, could well perform a function of paramount importance by acting as a nursery for the staffs of the centres, wherein they could serve the necessary initial apprenticeship or refresh their knowledge in technical methods from time to time. The Institute, in fact, has for some time endeavoured to carry out this class of work.

(h) An answer to this question has been given largely in the reply to the foregoing question.

There are certain classes of investigation which, I believe, could best be undertaken by officers working in a central research institution situated as the Muktesar Institute is. There are others which can best be undertaken by research officers, when they are available, in the Provinces. There are many which might well be taken up by the local research officers working in concert with the Muktesar Institute. Examples could be readily furnished of investigations falling into any one of these three categories.

(1) Researches into the etiology of rinderpest, preparation of serum against hæmorrhagic septicæmia, or laboratory methods of determining the value of vaccination against bovine contagious abortion, for example, could best be undertaken at the Muktesar Institute.

(2) Researches into the local incidence and types of piroplasms in cattle, the identification of the local helminth fauna, and the plants locally poisonous to livestock, for example, could best be undertaken by assiduous research at local centres.

(3) Researches into the application of treatment in surra, the identification of bacterial micro-organisms responsible for certain local diseases, and the value of certain methods of protective inoculation evolved experimentally, for example, ought to be undertaken by officers of the Muktesar Institute working in close association with the officers stationed at the local research stations in the Provinces.

APPENDIX.

Extract from the Manuscript originally submitted to Government of the Report of the Imperial Institute of Veterinary Research, Muktesar, for 1926-27 (as yet unpublished).

Rinderpest.—It is generally stated that the immunity following upon the serum-simultaneous inoculation against rinderpest is a permanent or life-long one. The recorded evidence found in the technical literature seems to support this view: for example, the records of the Egyptian veterinary authorities, who have especially investigated the point, indicate that cattle have been found to be solidly immune subsequent to the inoculation for as long as they have been tested, up to ten years afterwards.

This feature would commend the inoculation as the eventual solution to the problem of combating rinderpest satisfactorily in India, provided it can also be performed economically and with a reasonable degree of safety. Work has therefore been taken in hand at Muktesar to corroborate the view and, as mentioned elsewhere, an experimental dairy herd has been maintained for the breeding of animals which could be kept under observation for a number of years from birth onwards. It is economical to apply the inoculation to cattle at a very early age for several reasons, including the technical one that calves are relatively resistant to the effects of red-water infection. It has also been stated elsewhere in the annual report of the Institute that the reaction desired in Indian cattle after inoculation is of the "symptomless" or "blocked-out" type, for the reason that dormant internal parasites (coccidia, piroplasms) may be resuscitated to a dangerous degree of virulence by the supervention of a distinct rinderpest affection. Calves born in the experimental dairy, and some kindly lent to the laboratory by the Military Dairy authorities, have been immunised in this manner for some years, and experience has shown that calves only a few days old can be subjected to the treatment quite safely. Thereafter, their immunity has been tested by inoculation of batches with highly virulent material at selected intervals. The immunity has been found to last in a solid form for two years. Subsequently, it commences gradually to wane. By the third year the half-bred European animals were found to have lost their immunity to such a degree that they had become distinctly susceptible.

Some reports received from the Military Dairies have also indicated a decline in immunity among inoculated animals after this interval. However, much prolonged research is required to determine the influence of a number of contingencies upon the duration of the immunity, such as the age of the inoculated animal, the degree of reaction, and the breed or initial susceptibility of the animal, for we have even in India some controlled observations indicating that immunity may be considerably longer in duration than is indicated by our experiments.

There appear, in technical literature from time to time, accounts of the preparation of artificial vaccines for the protection of cattle against rinderpest. We have failed at Muktesar to demonstrate any useful vaccinating properties in materials prepared in many different ways from the tissues of heavily infected animals and treated so as to render them innocuous. Glycerinised spleen and other material, prepared according to the recent indications of Japanese workers who have claimed for such material pro-

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perties that render it highly useful even in field practice, have proved inefficient in our hands.

Researches upon rinderpest in the smaller ruminants, now in progress, bid well, however, to provide additional means of great value in the control of the disease. In a previous report, it was said that the infection had been successfully implanted upon rabbits. We were not successful in transmitting the virus of bovine origin beyond the first passage in sheep, but with this original inoculation the virus appeared sometimes to persist for a relatively long time in the circulating blood. Outbreaks of natural rinderpest are not unknown among sheep and goats in India, although these animals generally seem to be resistant to the infection in the scene of outbreaks among cattle: at Muktesar, goats wandering in the rinderpest side among heavily infected cattle have not been known to contract the disease. It was thought that some light would be obtained perhaps upon the manner in which infection could be made to gain virulence for the sheep from the recent researches of a distinguished German authority (Beller) upon the virus of contagious bovine pleuro-pneumonia. This worker had found that after inoculation of the virus into pregnant sheep it showed, by certain blood tests, signs of lengthy persistence; the virus was then discovered to have exercised a selective affinity for the foetal tissues, in which it had propagated and produced lesions simulating, there, the natural disease, although no trace of infection could be disclosed in the mother's own tissues. This research was carefully repeated upon pregnant sheep at Muktesar, by inoculating a series with rinderpest virus of bovine origin: the maternal blood of the sheep, which disclosed no outwardly visible symptoms, was found to harbour the virus, irregularly, for several weeks, but at no time were the foetal tissues found to be virulent, upon test inoculations into bulls. The bovine virus would then seem to be too low in infective power to traverse the foetal envelopes.

It was then thought that if the virus were introduced directly on the foetal side of the envelopes (by a careful surgical operation), the virus might be able to establish a foothold and increase in virulence towards the new host species by residence in the probably more delicate tissues of the foetus. The assumption proved correct: the virus very shortly traversed the barrier formed by the foetal envelopes, established itself also in the maternal system, and circulated freely in the blood. Thereafter, the virus was easily propagated in goats, by successive inoculation with small quantities of blood, and attained gradually a high degree of virulence for these animals; for example, until the ninth passage, three goats died and eleven recovered; from the tenth to the nineteenth passage, thirteen goats died and four recovered. The virus has now been maintained in goats for several months, both by direct passage through goats and bulls. The goat virus also possesses a high degree of virulence for sheep. It retains its affinity for the small ruminants even though, after the initial implantation, it is maintained by direct passage in bovines. It was also found that the anti-bodies in rinderpest serum readily traversed the barrier formed by the foetal envelopes.

The morbid changes observed in the animals are principally pneumonic, and not alimentary as in bovines. Lung changes are constant, while in animals that succumb rapidly no lesions may be clearly observed in the alimentary tract. The disease is readily transmitted by contact. We suspect that some outbreaks of so-called pleuro-pneumonia in sheep and goats in India are in reality rinderpest. The lungs in both affections exhibit the same histological changes, and also early become invaded, secondarily, with large numbers of certain minute bacterial micro-organisms.

The blood of artificially infected goats is virulent as early as the second day after infection, and by the fourth day has reached a high degree of virulence, when quantities as low as one-hundredth to one-ten-thousandth of a cubic centimetre may convey the disease to susceptible bulls. The severity of the disease produced by the goat virus seems to be generally lower than that conveyed by the bovine virus.

Means have therefore been found to overcome the distressing complication, often observed after this inoculation, caused by the unwitting introduction of virulent piroplasms with the rinderpest blood that has to be injected

simultaneously with the serum. The piroplasms are parasites that are highly specific for their particular hosts, and so by diverting the rinderpest virus to hosts other than cattle it becomes completely separated from the bovine piroplasms. The question of how to obtain a rinderpest virus that is not accompanied with the parasites of virulent red-water has therefore now been solved. The goat is a convenient animal for use as a virus producer; the rabbit was too small for convenient work and too prone to other diseases (rabbit septicæmia, coccidiosis) when maintained in large numbers. Researches are in active progress to discover additional means of extending the longevity of the virus, and it is hoped that methods will be found within the next two or three years for distributing rinderpest virus in good condition to all parts of India, so that when field workers employ serum for the protection of cattle they can with little more trouble and with little or no risk inject some virus at the same time, and extend the resultant immunity against rinderpest from one of a few days' duration to one of some years.

The system now adopted for economic production of serum against rinderpest has been criticised in the technical literature. It would seem that the experience in the Egyptian State Serum Laboratory does not coincide with our own (*Rabagliati*). Using Indian buffaloes, as customarily, as the serum producers, a large test was executed in which an adequately large number of buffaloes furnished serum according to our "immune" method, while a similar batch during a concurrent period of production were "hyperimmunised," after initial treatment with the same materials. The serum derived from these lots has been exhaustively tested—both the serum from the successive bleedings and the total mixed yield of each lot and the results indicate decisively that, so far as our customary producers are concerned, there is no advantage whatever in resorting to hyperimmunisation.

The immunity conferred by the inoculation of serum-alone has been held not to extend for an appreciably longer period than nine days. Experiments were executed to obtain more light on this point, both with the use of our preventive serum and the more highly potent serum-simultaneous serum. Unfortunately, the incursion of foot and mouth disease among some of the experimental lots somewhat vitiated the results, but the immunity conferred, even with the preventive serum, was longer than was anticipated.

Oral Evidence.

A.3240. *The Chairman:* Dr. Edwards, you are the Director of the Imperial Institute of Veterinary Research at Muktesar?—I am.

A.3241. Will you give us, shortly, an account of your training and past appointments?—I obtained my professional qualifying diploma from the Royal Veterinary College, London, in 1911, and took the Degree of Bachelor of Science in Veterinary Science of the University of London in 1912. Shortly after qualifying I was appointed research scholar in Veterinary Science under the Development Fund for three years. I spent the first year in London as research worker under Sir John MacFadyean, the second year in Paris at the Pasteur Institute and with Professor Valbec at the Alfort Veterinary School and the third year again with Sir John MacFadyean. I joined the army in 1914 and in 1916 was recalled to prosecute researches into certain cattle diseases at the Royal Veterinary College. From then until the date of my appointment in India to my present post, in 1921, I was at the Royal Veterinary College as Research Assistant to Sir John MacFadyean and during the last year I was also Professor of Hygiene at the College. During this time I was Editor of the *Tropical Veterinary Bulletin* for the Tropical Diseases Bureau, that is, for a total period of five and a half years.

A.3242. You give us in your note a very complete presentation of your own views as to the ideal organisation of veterinary matters under the Central Government and the manner in which such organisation might assist the Provinces. You rightly point out that the subject is a transferred subject. Do you think that, under the existing constitution, the officers of the Central Government would be welcomed in the Provinces?—No.

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A.3243. Do you not think it really essential to the success of any such scheme that their help should be welcomed?—Yes. They are welcomed to this extent: The officers in the Provinces and Army Veterinary officers consult me personally at Muktesar upon disease problems and they are given advice freely and in fairly considerable degree but, as things are at present in the Provinces, the officers would resent anything in the nature of what they would interpret as administrative interference.

A.3244. That is one side of the picture; and the other, put quite shortly, is that it is a hopeless proposition to attempt to deal with these cattle scourges on a provincial basis?—Entirely hopeless.

A.3245. How far do you think a campaign designed to deal, for instance, with rinderpest, might be successful without collaboration with the Indian States?—It depends entirely upon the method of intervention. If one were to apply the serum-simultaneous method as it has now evolved as the outcome of research, the subject of the Indian States would not loom very largely in the problem, because the cattle would be made permanently immune; but if one were to attempt effective control of the scourges on the basis that would be adopted in Western Europe, that is to say, by the application of standstill orders, or the application of the serum-alone method, then the problem of the Indian States would be a formidable one.

A.3246. Do you think that the isolated position of Muktesar is a serious handicap to its development as a centre of teaching?—It is a handicap in some respects, but for the teaching of what is technically known as epizootiology, that is to say, the methods underlying control of the great contagious diseases, its situation is ideal.

A.3247. As a centre of post-graduate training, do you think its comparative inaccessibility would be a serious handicap?—For general post-graduate training it would be, but if one were to develop the tributary station in the plains at Bareilly also for teaching purposes, there would not be any handicap, as Bareilly is quite accessible. Certain kinds of teaching could be undertaken there during the cold weather, but for the teaching of research into the nature and the methods of dealing with the great cattle scourges of India, the location of Muktesar is almost ideal for the reasons I have given in my note. Its topography makes ready isolation possible for the execution of the necessary experimental work, while its climate and the availability of plenty of suitable animal material for research work are additional factors in its favour.

A.3248. Could you carry on research work and education at Bareilly throughout the hot weather?—No; for research work in animal pathology generally one needs a cool climate. The cultivable parasites which are commonly the causes of disease cannot be manipulated readily in a hot climate: the cultures are very susceptible of becoming contaminated, while the instruments used frequently do not function properly, and there are many additional technical reasons which I could explain to you on the spot quite readily which interfere with the prosecution of research work in a hot place.

A.3249. Is Bareilly, in fact, a very hot place?—No, it is not a very hot place; at any rate it is not one of the hottest stations in India.

A.3250. I judge from your note that it is your view that a great deal of research work in veterinary matters requires to be done in the future?—A tremendous amount requires to be done.

A.3251. And if that work is to be usefully undertaken, it must be prosecuted by men of the highest calibre?—That is so.

A.3252. Would you like to develop that before the Commission?—I have given some notes on that point in my memorandum. The training of an animal pathologist is an especially prolonged one. There is a prevalent idea in India that if a young man with a science degree is sent home to undergo a course of training at one of the veterinary colleges, he comes back fit for research. Nothing can be further from the truth. Training in research requires long apprenticeship, an apprenticeship extending over several years, and a special aptitude for the work. The man must be prepared to forego the ordinary amenities, say, of clerical or administrative work. It is conti-

nuous work which must be undertaken without regard to office hours or to holidays; the work must be prosecuted immediately as the occasion for executing it arises.

A.3253. It would be necessary, I take it, to offer appropriate terms of engagement and remuneration if the right type of research worker is to be attracted?—When such men are needed there must be no bargaining.

A.3254. How about the five-year agreement? Have you anything to say about that?—I have considered it, and so far as concerns myself I must admit that I like to feel that my future is assured. If one were on a five-year agreement one might feel that at the end of that time one's career was in jeopardy, because one had severed one's connections in England during that time and had become forgotten at Home. And again, as regards the prosecution of a piece of technical work one cannot undertake to carry it out invariably according to time-table; one cannot be certain that the piece of work is going to mature so as to yield the results anticipated in five years. I might, in this connection, give you an example. Since my advent to India I have given my prime attention to rinderpest, and just now I feel that I am getting experienced in it, and that whatever piece of research work I undertake upon this disease leads relatively quickly to some result. Five years ago that was not so; I was largely in the stage of gaining experience in working with it. At the present time, I feel I am of some value to my Government as an authority upon this disease so that if my engagement terminated at the end of five years my Government as well as myself probably would be losers.

A.3255. Would you agree that it is almost invariably most difficult to prognosticate, with any degree of certainty, the amount of time required to carry out a particular piece of research work?—I agree. I may give you an example. Since my advent to India I have been endeavouring to cultivate the virus of rinderpest with the object, among other things, of making what may turn out to be an effective vaccine. I have been working on this subject for the last five years, and the endeavour is much like chasing a will-o'-the-wisp. One often feels one is near achievement, as one may, in reality, be at any time. Only just before leaving Muktesar with the object of appearing before this Commission I felt my spirits buoyed up by certain results. However, it very often happens that one has to revise one's opinions entirely as the result of the outcome of the experiments in progress and to undertake a further piece of work to clear up certain incidental phenomena which may last a year or two longer. Thus, one cannot execute the big research projects according to time-table.

A.3256. Or to speak figuratively, you regard it as unfortunate that Government, when it employs a research worker, should, from time to time, open the door of the laboratory and say "You do not seem to be doing very much; what are your results? Give us something that we can show to the public as a justification of your appointment"?—Yes; one cannot certainly judge the intrinsic or economic value of research work by publications, or by the output of publications recording the work in progress.

A.3257. I judge from your views on pages 15 and 16 as to higher education, that you form the view, as a result of experience in India, that conditions in this country are so different from those obtaining in Great Britain as to make it desirable that a special system of education up to the highest grade should be developed in India independently?—Yes; independently of any traditional developments at Home.

A.3258. Does the absence of the private practitioner affect profoundly the whole situation?—Yes; moreover, as I have stated in my note, nearly all the trained personnel in India are required for State service, that is to say, to combat the great cattle scourges primarily, and not for clinical cases.

A.3259. Do you attach importance to the granting of a degree qualification for the higher posts in the new provincial services?—That is rather a difficult question to answer. For several reasons, a degree certainly gives a feeling of self-satisfaction and of relative social status to its possessor. It raises also the status of veterinary research when it is recognised as a pursuit for which a degree can be obtained. But, from the point of view of the value

of men, one finds sometimes (at least I have found) that young men when they enter a research laboratory think that the acquisition of a degree is something to be aimed at primarily and not the technical competence which is really the result of apprenticeship or of prolonged training and hard work. One knows very well that certain people who are in possession of high degrees are sometimes markedly inferior in competence to those who have not got such degrees. I have in mind people in my own vocation who have such degrees and have done no research work of real value, and certain other people with relatively low degrees who have gained international repute; they do not need to put any degrees after their names; it is sufficient simply to mention their names to be assured that any efforts to which these names are attached must bear the impress of competence.

A.3260. Plainly, it is desirable to keep open, for Indians in the profession, posts outside India but in the British Empire, and it would be important for that reason to have recognised, by the Royal College of Veterinary Surgeons, any degree given in India. Have you any views as to whether the Royal College would recognise degrees given in India?—I do not see how they could refuse to recognise the qualification if the teaching and examinations were up to the standard prescribed by them.

A.3261. And it might be an advantage that the standard in India should be set and maintained in tune with the standard of the Royal College; or would that be too high in your view?—Not too high; but as I have stated in my note the aim of training should be somewhat different in India from what it is at Home where candidates for the diploma of the Royal College are trained for the most part to become practitioners. In fact, one would say that the needs of India are for a more scientific training, as this term is generally understood.

A.3262. A different objective but not a lower standard?—Yes; and one needs in reality, for the work at hand in India, a much higher standard.

A.3263. But there is no reason, in your view, why the Royal College of Veterinary Surgeons should not recognise an Indian degree?—No.

A.3264. Do you think it would simplify and cheapen education in veterinary science if there was one common training centre for all India, or do you think training could be given in two or more centres?—It would certainly be a great advantage if the training were centralised but, from consultation with my colleagues, I find that there are difficulties. It would be very difficult to get people from Madras to come to a single centre, say in the Punjab. But that difficulty might be got over by the institution of a common board of examiners and also by the creation of a board which would lay down a common system of training. In fact that has been laid down to some extent at the meeting of Principals which was held in Bombay in 1922, of which I was secretary. There we laid down a common scheme of training lasting for four years.

A.3265. Have you ever contemplated the possibility of the Central Government joining with a Provincial Government to equip an organisation for higher teaching? Take, for instance, the large and well-equipped college at Lahore, with which you are familiar: do you think it possible to arrange a scheme by which the Government of India might make itself responsible, in whole or in part, for a Chair of Veterinary Science located at Lahore, and would that give satisfaction?—It would certainly be a step in the right direction; and this is a matter which, I believe I am right in saying, the Government of India have taken up already to some extent. When the veterinary officers in India sat in conference at Calcutta early in 1923, Mr. Hullah (Secretary to the Government of India in the Revenue Department) put before us a note regarding the centralisation of training at Muktesar. The same kind of investigation might apply to the institution of Government of India Chairs at the premier veterinary colleges in the Provinces.

A.3266. It would be unfortunate to waste public funds in erecting new and costly buildings, when existing buildings can provide all that is required?—The buildings at Lahore are probably better than most buildings erected for the purpose anywhere else in the world; they are certainly better than any veterinary college buildings anywhere in England.

A.3267. One sometimes wonders whether the supply of scientific deities is equal to the supply of temples?—It is not so in England where the deities work in very humble surroundings.

A.3268. And Pasteur worked in underground cellars?—I believe so at the commencement of his career; it was certainly so with Claude Bernard.

A.3269. Provided the research worker is not asked to teach too much or subjects too elementary, do you think that the research worker would benefit by doing a certain amount of teaching?—I think so. I have endeavoured to follow that principle myself. At Muktesar I endeavour to lecture twice a week in order to keep myself *au courant* with the whole field of research in my vocation. In this way the worker has to recapitulate the whole knowledge pertaining to a large field of research year after year, and develop powers of expression which enable him to fix obtruse concepts clearly in his mind. I think some amount of advanced teaching in this way is beneficial to a research worker.

A.3270. On page 15 of your note, you refer to a central standing advisory committee to deal with veterinary education and you give there a reference which I have not yet had the opportunity to turn up. I want to ask you whether the composition of such an advisory committee is described in the document to which you refer?—No; it is not described; but its composition would be really easy to contemplate. A similar body was called together by the Government of India in 1922, namely the meeting of Principals which took place at Bombay to revise the curriculum of the veterinary colleges, and it consisted of the Principals of the four veterinary colleges, one Field Officer of standing, and the Director of Muktesar as secretary.

A.3271. Would that, in your own view, be an efficient body for this purpose?—It would be.

A.3272. *Professor Gangulee*: Did they succeed in making the curriculum more or less uniform?—We drew up a standard curriculum lasting four years.

A.3273. Has that curriculum been adopted by most of the veterinary colleges?—It has not been adopted. It has been followed to some extent at the Punjab Veterinary College; but no Government has yet passed orders based upon the findings of the committee.

A.3274. The findings of the committee dated as far back as 1923?—The findings of the committee dated as far back as February 1922; they were put before the 'Meeting of the Veterinary Officers in India' in Calcutta in 1923 and approved.

A.3275. *The Chairman*: Was it the idea that apart from the central standing advisory committee, of which we have been talking, there should be other committees dealing with different branches of veterinary education; or was it the idea that the outlook of the standing advisory committee should be comprehensive?—The outlook in regard to veterinary education would be comprehensive; at that meeting standing committees were also recommended, firstly for civil veterinary administration, secondly for research, and thirdly for education.

A.3276. The training of officers in the business of administration, the training of research workers, and the whole field of education would be included?—The whole field of education would be covered by the standing committee.

A.3277. You give us your views as to the insufficiency of the State veterinary staff. Is it also the case that there is great shortage of anything in the nature of veterinary police or officers who could do the work of veterinary police? If you attempted to administer a complicated Act involving the control of the movements of animals, you would not have the instrument at your disposal to enforce the terms of the Act?—One would have to apply the Act largely in the light of the accumulated experience of other countries. In England the policing, I understand, is undertaken by the police organisations of the local authorities. The technical matters of control, say, in foot and mouth disease, such as the extent of slaughtering, diagnosis, etc., are undertaken by or under the direction of the veterinary staff; but the

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actual control of movements along the roads is undertaken by the police force, the scope of the control having been denoted by the civil authorities acting upon the advice of their technical veterinary advisers.

A.3278. And you probably agree that the close control of, for instance, movements of animals in rural districts in India, would be a very difficult matter?—It is difficult in any country. It is not so difficult in countries like those of Western Europe where they have adequate police forces. But I feel that a beginning must be made some time. Although the steps taken might be very inadequate at first, they would mark the inception of what must be, after all, the only rational and effective means of control, which might take, thereafter, a century or more of evolutionary development to attain something near perfection. One must remember that in Europe disease control is the outcome of education and experience that have extended and developed gradually since the establishment of the first veterinary school at Lyons in 1780 or so, and we should not in India expect complete and immediate satisfaction from the adoption of a policy that has behind it nearly a century and a half of experience in Western Europe, although with the available recorded experience of Western countries, progress in India might be much accelerated.

A.3279. Could you give us any idea of what you regard as the minimum strength of the department in any one Province required to effect a substantial reduction in the amount of epizootic diseases?—That question is a somewhat difficult one, but last March, when I was called upon by the Government of Bihar and Orissa to advise the Director of Veterinary Service in regard to education, I made a very brief attempt to compute the increase of staff that might be necessary for completely effective control of disease in the Province, and I reckoned that, based on the experience of western countries, it would eventually have to be increased ten times over its present strength.

A.3280. That would involve a formidable demand on the finances?—But it would be worth while.

A.3281. Would it be a good investment in terms of rupees?—There again I made a brief computation, and it seemed to be well worth while considering the value of the live stock, the present losses and, worse than all, the present great impediment to improvement in live stock through the prevalence of the great cattle scourges.

A.3282. And in cases where disease destroys an important proportion of the working bullocks, you may have a substantial part of one season's crop lost owing to the absence of the means of cultivation. Is that so?—That is so, but there is the overwhelming consideration that, in any country where the great cattle scourges are prevalent, no potential breeder is going to take the necessary tedious steps to improve his breeds if his efforts are, sooner or later, to be annihilated through the incursion of disease; so, large numbers of worthless cattle are allowed to survive.

A.3283. I want to ask you one or two questions about the possibility of initiating a campaign of immunisation against rinderpest by the serum-simultaneous method and about the policy which might be adopted. First of all, do you regard the results within reach by using the serum-alone method to be definitely limited, as compared with what we may reasonably hope for from the simultaneous method?—Yes. The serum-alone method confers immunity which lasts a few days, something under a fortnight, although when applied in conjunction with standstill orders it may be most valuable. It may break, in this way, the chain of transmission of disease, and that is what seems to have occurred in the experience of some Provinces. But in the absence of legislation for the enforcement of standstill orders, the results cannot be otherwise than poor. In other countries such as Egypt, the serum-simultaneous method has become the only method which is applied.

A.3284. Does the manufacture of serum form an important element in your budget at Muktesar?—It is the most important element.

A.3285. Has that fact influenced the policy of the institute at Muktesar?—Yes. It has influenced policy to such an extent that Muktesar has become in reality a factory in its main aspects, and not a research station.

A.3286. Do you think there is any danger that the fact to which you made reference may instinctively prejudice judgment in favour of an attempt to extend the serum-alone method, rather than to advance boldly with the simultaneous method? Do you think the fact that Muktesar is being financed so largely for the manufacture of serum-alone has at all been responsible for the delay (if there has been delay) in advocating and prosecuting a bold policy of immunisation by the serum-simultaneous method?—I do not think it has been important. There have been many factors which have contributed to the delay in the general application of the serum-simultaneous method. First of all, when it was applied in the early days there were some accidents, and in India one has to be very careful in regard to accidents. Although in places like Uganda (I know from the results) they may have ten per cent mortality or more following on the application of the serum-simultaneous method and the authorities are not brought to task for it, yet in India one has to be very careful because of the prejudice against accidental losses among the cattle. Then there is the other factor, namely, the prevailing antipathy of the Hindu towards manipulation of blood in any form, and blood has to be used in the inoculation; there is also the fact that, until recently, there was always a risk of complication in the course of the operation through the supervention of piroplasmoses (red water) when the blood was used for inoculation, but during the course of the last few months we have been able to overcome that difficulty.

A.3287. Do you think that the moment is approaching when a forward policy with the serum-simultaneous method might be attempted?—Yes. I have had discussions with my colleagues recently in regard to this, and what one of them at any rate proposes to do when he gets back to his Province is to get a trained officer with a special team to go round from place to place and establish serum-simultaneous camps.

A.3288. It appears that there are three policies which might be adopted in going forward with the serum-simultaneous method. First, you may have an attempt to immunise the major portion of the cattle in India; or secondly, you may make an attempt to place barriers of immunised cattle across the lines on which infection is found to move, or to place belts of immunised cattle round about particular areas, and thereby attempt to protect both the cattle in the belt and the cattle in the protected area from infection; or lastly, you might attempt the policy of selection and immunisation, on the one hand, of the useful working bullocks and, on the other, of only those breeding animals which appear to be worth protecting?—Yes.

A.3289. Have you come to any views as to which policy you would recommend?—I have not studied the matter profoundly, but I can give you some information upon the matter. The policy of establishing a belt of immune cattle was attempted by the South African Government just after the War, by Gray and his colleagues, from Lake Nyanza to Tanganyika, when there was danger of rinderpest spreading to South Africa again through the movements of the German troops during the War. The policy seemed to be completely successful, but one was dealing there with a great area to the south which was already free from rinderpest. The other policy of immunising the major portion of the cattle in a country has been tried by the Italian authorities in Eritrea, apparently with success. They state that they go through the country once every two years. In India, as latent centres of infection exist throughout the country, I am rather afraid that the policy of establishing belts would not succeed. The policy of going through the country every two years as in Eritrea would again not succeed, because it would be very difficult to get hold of the large proportion of unimportant or relatively useless nomad cattle. So, I think that the third policy that you have enumerated, namely that of immunising and protecting only the most valuable of the working and breeding cattle, would be the best policy to adopt as a beginning.

A.3290. There is a great deal to be learnt which can only be learnt by actual experience?—Yes, by actual experience in the field.

A.3291. And the experience of other countries is only helpful up to a certain point; you have to build up your practice by Indian experience?—

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Yes. They have had difficulties in Africa which we are not likely to encounter in India. They have had formidable difficulties in East Africa, and particularly in Uganda, because the material they have used as the virulent blood has been frequently contaminated with parasites which, happily, we have not got with certainty, or, at least, to a considerable degree, in India at the present time, namely, the trypanosomes (notably *Trypanosoma congolense*) of Nagana and others, and there are certain other diseases of cattle (contagious pleuro-pneumonia, etc.) which we have not got here. With the discovery of what may be called technically a "clean virus," the danger has still further decreased. We have been able recently to get a clean virus as the outcome of research; this was done by "fixing" the disease in goats. Goats are not susceptible to the common complicating animal parasites (piroplasms) which were almost invariably found when the virus was derived from Indian cattle. We have been able to estrange, as it were, the rinderpest germ from cattle and in this way get a clean virus which will not communicate the germs of these complicating diseases.

A.3292. Are you satisfied that the use of goats does not reduce the pathogenic power of the organisms towards the bovine host?—We are carrying on intensive research upon that point. The passage of the virus through goats brings about a certain diminution in virulence, but not a very great one, and we are endeavouring to find out whether the degree of reaction in immunised animals has some relation to the duration of the immunity. In the fact, we have found out rather a disconcerting matter in the course of the last year or so, namely, that by "blocking out" reaction by giving excess of serum to young cattle the immunity lasted in a solid form for just under three years only, although Egyptian experience had gone to prove that the immunity after the serum-simultaneous inoculation was lifelong. That limitation is not likely to prove really a very serious factor in practice because every two years one can resort to the injection of the immunised cattle with a little virulent material alone. It is not therefore likely to be a great handicap.

A.3293. These are points intensely interesting but highly technical and we could hardly go into them in detail with any advantage. May I take it that, broadly speaking, it is your view that while a great deal of research requires to be done, the situation is, on the whole, hopeful and there is every chance of the technique of serum-simultaneous inoculation being simplified within the next few years?—In regard to that point I have said in my note that, so far as research is concerned, there is no reason why this great disease of rinderpest should not be obliterated within a measurable period of time. With experience, and especially if one had in the Provinces the specialised teams I have already mentioned, there is no doubt but that the application of the method would be fraught year by year with fewer and fewer risks.

A.3294. Do you agree that the immunity in animals inoculated by the serum-simultaneous method may be refreshed, as that immunity begins to fade, by the injection of infected blood only, without serum?—Yes. It would be very cheap. Once every two years one would inject merely under the skin a little fresh virulent material.

A.3295. Is there a danger of conveying rinderpest to susceptible animals by infection during the period of reaction?—There is a slight but appreciable risk. The degree of risk, however, has often been greatly over-stated in the past and very unnecessary precautions have been undertaken to prevent the spread of rinderpest from the immunised animals to the surrounding healthy ones. There is a prevailing idea that rinderpest is an extremely contagious disease. Now, we find at Muktesar as the result of profound research that the virus of rinderpest is an extremely fragile one and easily killed. The main laboratory building at Muktesar is situated on a small promontory. On one side we have what is known as the rinderpest side containing animals infected with this extremely deadly disease; on the other side we have animals used for other purposes. Yet, in our experience the disease never spreads from one side to the other; the mere intervention of this small promontory is a sufficient barrier and the reason why the disease does not spread from the one side to the other is because there is no movement of the animals themselves.

across this promontory. In inoculation camps specially established for the purpose of carrying out the serum-simultaneous method, I believe that the degree of precaution that would need to be taken would be relatively small.

A.3296. If you once master rinderpest, you may hope to have a district so free from infection as to render it unnecessary to immunise each animal in that district every two years?—That is so. Rinderpest is caused by a very fragile virus; it is very likely that after one has had a considerable proportion of the cattle in the country permanently immunised their existence would be sufficient to break the chain of transmission.

A.3297. *Mr. Calvert*: What exactly do you mean by the chain of transmission?—I mean the propagation of the infection by passing from animal to animal. The virus multiplies in the blood and the tissues and it is excreted in the urine principally and to a small extent by the other discharges. In the urine shed on the ground the virus dies within about forty-eight hours, as proved by experiment, so that the germ cannot remain alive for a long time on one spot outside the animal body. Thus, to keep the germ alive, you must always have a number of healthy animals available for infection through which the germ can pass and multiply. Now, if the germ encounters a body of resistant animals it cannot multiply and hence the chain of transmission, as we call it, is broken. We know very well that this phenomenon occurs with another serious cattle disease, namely, hæmorrhagic septicæmia. There the virus is a little bacillus, which we can readily isolate and study in the laboratory. If we inoculate the animals in the beginning of an outbreak with serum they are protected for a time against the disease and the germ, which must have other animals available for its propagation, fails after extension from the already infected animals to encounter any susceptible animals; the chain of transmission is broken, and the outbreak stops.

A.3298. Does the animal get the disease by eating infected food?—In rinderpest, by eating infected food which has recently been contaminated by infection voided by an infected animal.

A.3299. Are the discharges also infectious?—We have found that discharges from the saliva and nasal discharges are of very low infectivity. It is by the urine mostly which conveys the virus. The food becomes contaminated usually by urine excreted by infected animals.

A.3300. *The Chairman*: In the manuscript of your annual report, 1926-27, you refer to the recent researches of a German authority, Beller, upon the virus of contagious bovine pleuro-pneumonia. Do you accept the result of that experiment?—I accept the results. I have had some reason to believe for some time, in my investigations upon rinderpest, that the virus is rather akin to that of contagious bovine pleuro-pneumonia and I have been induced further to believe that by carrying out comparative studies on the latter germ I may be able to get certain information which will enable me to obtain more light upon the rinderpest germ, and probably cultivate it. However, by repeating Beller's researches on pleuro-pneumonia with rinderpest I was able to fix the rinderpest virus upon goats and upon small ruminants. Beller found that sheep infected with the pleuro-pneumonia germ still showed signs of infection for some time afterwards, as disclosed by blood tests, and the germs were actually found by him within the tissues of the foetus in the case of pregnant ewes. I thought the same thing might occur with rinderpest and injected the sheep with virulent rinderpest blood and endeavoured to find out whether the virus became established in the foetal tissues. To my surprise it did not become established in the foetus although it persisted for some time in small amount in the maternal blood. I thought then that to fix it upon the small ruminants it might be well to intervene on the other side of the placental membranes by injecting the foetal envelopes with the virus, in order to find out thus whether the virus could establish itself in the extremely delicate tissues of an embryo, as the maternal tissues had proved highly resistant, but the virus, it transpired, became established in the embryonic tissues and after having got a foothold in this way passed readily in the other direction, through the placental membrane to the maternal tissues, having gained in the process sufficient virulence to become thereafter firmly established in them.

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A.3301. In that direction you achieved positive results?—Yes. I was able to fix the virus upon the small ruminants, so that now it is readily propagated in them in the ordinary way, by simple blood inoculation. The research had a very important outcome, in that it enabled us to obtain a "clean virus," (free from complicating piroplasms) for cattle.

A.3302. On the administrative side, what degree of training would be necessary in your view to train a subordinate staff, employed wholly on serum-simultaneous work, efficiently to administer inoculation in the districts?—If a Province contemplated the application of this method on a fairly general scale it ought to have one responsible Class I officer, well trained, to direct operations. It is very difficult to stipulate the term of training. I have now under training at Muktesar two subordinate men from Mysore State, which is very go-ahead in this matter. They have come for three years. I have given them a course of training lasting three years upon this method and upon the manufacture of serum. With the basic training of a Class I officer, it might not be necessary to keep him at Muktesar for that length of time. If he studied for a year he would master the peculiarities of rinderpest to a sufficient degree to go forth as an operator in charge of a special staff of subordinate men. Under him there should be two or three Veterinary Inspectors, who should have spent a few months at the laboratory and have observed the actual practice of our work, and some Veterinary Assistants who need not be trained for any considerable time but who would assimilate the technique in the course of experience.

A.3303. It will not take very long to train the men required actually to administer the inoculation to the animals in the districts?—No. It would not. There are facilities for the training in the country already. If these men were deputed to Muktesar, they would not necessarily undergo a set course. If they would observe the current procedures of the laboratory, they would pick up sufficient knowledge within what must be called a relatively short time.

A.3304. There appears to be a curious disparity between experience in Egypt and India as to the length of time during which immunity is conveyed by the serum-simultaneous method. Is it likely that in the near future further research will clear up that point?—We are undertaking research to that end at Muktesar at the present time. I have got a number of experiments in progress at Muktesar to ascertain what is the cause of this difference in experience. We have got an experimental dairy for the breeding of young animals specially for this work so that they can remain under our observation from birth onwards and I have at the present time batches of calves immunised in various ways, namely, some very young, some rather older, some immunised after undergoing an inappreciable "blocked-out" reaction, and still others after undergoing an appreciable reaction; at intervals in the future, tests will be made to ascertain the state of their immunity by inoculation with virulent material.

A.3305. If a country-wide campaign of serum-simultaneous inoculation were to be launched, how many stations would be required for the preparation of material?—Serum is now obtainable from Muktesar only and in present conditions it probably can be obtained more cheaply from a single large manufacturing centre than from a considerable number of small ones, because the cost of production of a unit of serum varies somewhat like the cost of a unit of electricity: the more you produce the cheaper is the cost of each unit. One may contemplate, however, the possibility of a very much greater demand for serum in future, especially with the adoption of the serum-simultaneous inoculation on a large scale, and in my opinion it would then be safer to establish a few more centres. As conditions are at the present moment in India, the Provinces are probably served best by having a single centre at Muktesar; but with a large increase in the demand it would probably be better to have some more centres for several reasons. One of these reasons is that if a formidable outbreak of rinderpest were to occur in the Bareilly district serum manufacture might well be held up temporarily and protective operations thus be brought to a standstill for all India. With regard to the virus a great many small stations could be readily established: in fact, a centre of production could be easily established wherever the virus was needed for immediate

application by merely propagating goat virus despatched in the first instance from Muktesar.

A.3306. *Professor Gangulee*: But the multiplicity of centres for the production of serum would put up the cost, would it not?—Yes.

A.3307. Have you envisaged the enormous demand required to meet the needs of an All-India campaign; an enormous supply is required, is it not?—An All-India campaign for the prosecution of the serum-simultaneous inoculation might very well establish a demand for serum equal to about ten or twenty times the present demand, which would be far more than a single centre should undertake for various reasons, such as the possibility of a breakdown in organisation and the like.

A.3308. *The Chairman*: Are you satisfied with the precautions and rules, at present in force, designed to prevent the entrance into India of animal diseases, and the spread of those diseases which already exist in the country?—My views with regard to that matter have changed during the course of the last few years. When I first came to India I thought that this was a matter of supreme importance in view of the disastrous experience of Western countries in regard to tuberculosis. In Western Europe generally, about thirty per cent of the cattle are affected with tuberculosis, and this high incidence of infection, which is often accompanied by serious clinical disease, constitutes a tremendous public health and livestock problem. The figures one had at that time indicated a very low incidence of tuberculosis in India; in fact, in many places tuberculosis was said to be unknown; and it therefore seemed that drastic measures should be taken at the ports of immigration, to prevent the entry of this formidable disease into India, as the country was in the fortunate position, in which the disease was negligible in its distribution and any cases that were detected could be exterminated at relatively very low cost. With the aid of the Indian Research Fund Association I was able to obtain a trained worker to co-operate with me at Muktesar on investigations into tuberculosis, and we have made a number of important discoveries. Firstly, the germ of bovine tuberculosis in India, where it is found, is as highly virulent as the germ which causes the severe tuberculosis of Europe. Next, tuberculosis is not a rare disease in India. My colleague, Dr. Soparker, has found at Ferozepore, on close examination, that about fourteen to sixteen per cent of slaughtered cattle are actually affected with small lesions of tuberculosis. We have reasons to suspect that the incidence of infection is even much higher than that. During the application of the tuberculin test to Indian cattle we have found at times a disconcertingly high proportion of apparent reactors. On *post mortem* examination, we have discovered, in some of these animals, no visible lesions of tuberculosis; but nevertheless the germ was isolated from certain tissues by special laboratory methods (the so-called "no-lesion reactors"). Then, we are told that in India the forms of tuberculosis which in Europe are known to be caused, to a very large extent, by the bovine type of germ, especially bone and joint tuberculosis and cervical gland tuberculosis, bear the same proportion to the other forms as they do in Europe, so that bovine tuberculosis in India may already be a severe problem from the public health standpoint. There is pressing need to investigate the matter further. Again, we have carried out researches on a large scale at Muktesar to determine whether the cattle of India are more resistant to tuberculosis than are the cattle of Europe. My colleague, Dr. Soparker, and I differ a little in regard to the interpretation of the findings. We have found that a large proportion, at any rate, are quite as susceptible to tuberculosis as European cattle, but some are relatively resistant and a good many of these are cattle with an admixture of European blood. Our belief is now that the relative resistance of these animals may be due in large measure to the existence in them of latent infection of the kind already mentioned. Anyhow, the position seems to be that the extremely low incidence of clinical affection of cattle in India is attributable to the manner in which the cattle are ordinarily maintained, namely in the open, where the chances of massive propagation are small, and that we need not, in the light of these findings, take the drastic steps that were contemplated as *prima facie* necessary some years ago to exclude European infection. The danger of a spread in India is not great and that is attributable, as I have said, to the manner in which cattle in this

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country are kept. We have had some experience at certain of the military dairies, (notably at Quetta), to show that when cattle in India are maintained in exactly the same conditions as they are maintained in Europe tuberculosis, when it occurs in them, spreads with the same rapidity and with the same intensity as it does in Europe.

A.3309. Your experience suggests the great importance of close touch between public health and veterinary officers?—I consider that there should be the closest co-operation between the two departments. In regard to this matter of tuberculosis I had it put to me by the Indian Research Fund Association recently that my colleague should devote more of his time to the human side of the problem; but in reality we have both realised from our experience in tuberculosis research that tuberculosis, whether in men or animals, is one and the same problem from the experimental standpoint.

A.3310. *Sir Henry Lawrence*: On page 18 you suggest methods of control in the case of certain diseases. Some years ago certain officers of the Punjab. I think one of them was Col. Walker, published some results of the methods of control proposed by them for foot-and-mouth disease. Have you had occasion to investigate those methods?—During my absence on leave last year one of my colleagues tried the method at Muktesar, upon very good material, in order to corroborate the findings of those workers. We require for our work a considerable number of hill bulls, and not infrequently they come in infected with foot-and-mouth disease, or we may already have foot-and-mouth in our segregation kraals, and we then apprehend a spread of the disease to other healthy incoming animals. My colleague applied the method recommended by Col. Walker and Taylor to certain of these batches of clean animals coming into the station, exposed them to infection by mixing with animals infected with the disease, and the method proved, in his hands, entirely inefficacious, the disease being, it seems, too virulent, to be affected by the treatment. I have applied the same principle to the control of rinderpest, by the injection of formalin into the veins, as had been recommended previously by a worker in Europe in the case of foot-and-mouth disease. When one carries out work of this kind on a very small scale the results often appear very encouraging, but when one applies the indications on a large scale they not infrequently prove to be of no utility for practical adoption.

A.3311. Are you making any further investigations as to how you could control foot-and-mouth disease?—We are not doing so at Muktesar for the reason that this subject is now under intensive investigation in a number of very well equipped laboratories in Europe, being as it is now a problem of prime importance in the countries of Western Europe.

A.3312. That is on the Continent?—On the Continent as well as in England. Foot-and-mouth disease is under investigation in England both in the Ministry of Agriculture's laboratories at Weybridge and at the Lister Institute, and it is also being investigated in France by the foremost authorities under the French Government, and in Germany as well. With our relatively small staff at Muktesar it would not be profitable to divert our energies, especially on a considerable scale, to work upon foot-and-mouth disease, having regard to the relative significance of this disease in India.

A.3313. *Sir Thomas Middleton*: Some years ago the impression gained ground that the selection of Muktesar as a site for veterinary research had been a mistake. I take it that your experience entirely negatives that view?—It very largely negatives that view. For purposes of research into the great cattle scourges, it is an ideal station; its very inaccessibility, as I have said in answer to the Chairman, makes it an ideal station for research into such problems.

A.3314. The first requirement for India and a matter of prime importance is that there should be a centre for research into the great cattle scourges?—That is so.

A.3315. Your answers suggest that ancillary stations are wanted in other parts of India to take up subjects which cannot conveniently be dealt with at Muktesar?—Yes, there are problems which could be better dealt with at the local centres.

A.3316. In your note you draw attention to the great importance of research in connection with parasitic works?—Yes; this class of research is of immense importance.

A.3317. That is essentially local work, I take it?—Largely; there must be a wide range of worm parasites affecting stock in India. We have done some worm work in Muktesar, especially on the treatment of worm affecting dogs, and we can do a certain amount of general helminthological work there; but the question of worm infection in animals in India is of such tremendous economic importance that it ought to be taken up locally by the several Provinces. There is an enormous amount of work awaiting to be done in India by the helminthologist working in collaboration with the animal pathologist.

A.3318. I take it nothing has been done in connection with those parasites?—Extremely little, almost nothing.

A.3319. Until recently little was being done in England?—There is now available a vast amount of knowledge obtained as the result of the efforts of specialised workers in other countries which could be readily applied to economic effect, in India, with a little specialised work to determine the nature and incidence of parasitic infections.

A.3320. If ancillary research stations were established in India, the natural centres would be the Presidency colleges?—This is a rather difficult question to decide. At the present time, very minute centres of laboratory work capable of considerable development are in existence in close association with the headquarters of the Civil Veterinary Department in the several Provinces. The work carried out at these centres, although classed as routine work, need not be regarded in reality as entirely routine in character; it is now work of the nature of the examination of blood smears and other material for the diagnosis of disease, in the Provinces, for the guidance of the field subordinates. Now such centres could be developed to a very considerable size. But there is undoubtedly also much work of a tributary or ancillary nature which could well be done by University workers, for example, on such problems as the ticks. Extremely little work has been done on these parasites of livestock in India, although there is an incalculable amount of disease caused by these parasites. I think work of this nature could very well be directed or done by biologists in occupation of University chairs.

A.3321. Or by teachers in colleges?—Yes.

A.3322. Is it not very necessary, in view of the need that there will be in India for well-trained veterinary surgeons, that research should be in progress in the institutions in which they are being trained?—It is most important from the point of view of the teacher; experience shows that unless a teacher makes up his mind early to develop competence by pitting himself against men of international repute, in a few years he becomes a sort of human gramophone.

A.3323. You point out in your note that the demand in India is for what you term "State veterinary medical service". Now, that is a demand of the Government. What about the demand of the cultivators of India? Do they not require practitioners just as the farmers in England do?—I have stated in my note that it is no real concern of the State. If the cultivator wants such men he should take such steps as have been taken by the cultivators of Great Britain; he must be prepared to pay these men direct for advice and for curing the sporadic diseases of his animals.

A.3324. Theoretically that is no doubt true. But I have asked many veterinary surgeons in India whether there was any chance of their making a living by private practice, and the answer invariably was that there was almost no chance except in the neighbourhood of towns. The cultivator at the present time is not prepared to pay; and I dare say you know that in some very poor localities in Britain it is the same. At the present time the district boards in India are attempting to provide a veterinary service which corresponds to that supplied by the ordinary veterinary practitioners in England. The question I now want to put to you is this: Do you think

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that, in view of the double need of India, you might have for Indian veterinary surgeons a superior qualification which would be taken by men entering the State Veterinary Service and a lower qualification which would be available for Veterinary Assistants working under the local boards?—That possibility has been considered already by the veterinary authorities in India. At the time of the Calcutta Veterinary Conference in 1923, my most senior colleague, Col. Walker, and I put before the meeting that there should be two cadres, a higher one recruited from men who had undergone a course of four years training on the lines mapped out at Bombay, and a lower one recruited from among men with probably a two years course who would be fit just to inoculate animals and perform the ordinary veterinary manipulative operations, without pretending to a rational knowledge of their vocation. Our view, however, was not acceptable to the great majority of the veterinary people present who considered that the recognition of any shorter course would be a retrograde step, as Governments would be only too ready to believe that the shorter course was really all-sufficient. So, the problem is an extremely difficult one. From the point of view of the State the cattle scourges are all-important and, from that point of view, steps should be taken to establish a system of education capable of producing men able to control them.

A.3325. That is admitted, but it being obvious that the ordinary ailments of Indian stock are getting no attention at the present time and that the number of veterinary assistants is very small, would it not be better to turn out men who can treat simple cases, ordinary cases that one meets in practice, rather than go without any skilled aid?—Do you mean in addition to the first class men?

A.3326. I mean that there ought to be two qualifications, an upper one for the State Veterinary Service, and a lower one for the veterinary dispensaries?—Yes; that has been my view; but probably the better opinion in regard to such matters could be obtained from my colleagues who have actual experience in the field. What I have dealt with particularly in my note is the great importance of the great cattle scourges to the State. If one were to divert the attention of the existing staff to the clinical or sporadic cases, negligible to the State but of great importance to the individual owner, one would be neglecting the bigger problem.

A.3327. I think you forget that, whereas the ordinary Veterinary Assistant might not be of value in research or in directing any campaign against, let us say, rinderpest, he would be a very valuable asset as a member of a corps formed locally for fighting rinderpest: he would form one of a reserve of officers which the State might fall back upon in an intensive campaign?—Yes. I think I have said in my note that whenever or wherever a district authority feels in its generosity or philanthropy that it ought to provide such men, it might well do so.

A.3328. Do you agree that the ordinary ailments of the cattle of India are at present being neglected?—The ordinary, or sporadic, ailments are being largely neglected.

A.3329. What is the size of your technical staff at Muktesar at the present time?—In Imperial officers?

A.3330. Yes?—I have, actually working with me at the present moment, three Imperial officers.

A.3331. Are these all Members of the Royal College of Veterinary Surgeons?—I have three of them.

A.3332. Are they all graduates?—Two of them are graduates of Universities.

A.3333. You allude to the great difficulty in getting veterinary surgeons qualified for research at the present time, and you attribute that to post-War conditions. Your statement is certainly correct; it is certainly most difficult to find young officers who are prepared to take up scholarships, such as you yourself took up in 1912, in order to qualify themselves as research officers. But I do not think it is altogether due to post-War conditions?—I was at Home on leave last year; there is a great deal of

despondency prevailing among teachers in regard to the relative apathy of the present day student as compared to the energy and the enthusiasm of the pre-War students.

A.3334. That might apply to veterinary institutions; but we, in Britain, offer precisely the same scholarships that were offered in 1912 and we get a very good lot of applicants for such subjects as agricultural chemistry or botany, but we could not get a single suitable applicant for veterinary subjects?—There are some difficult matters to explain. Most of the young men who enter veterinary colleges have no intention whatever of becoming scientists; they have relatively low basic qualifications and merely want to become practitioners, give advice to farmers and get an immediate remuneration. Again, in the veterinary colleges in England there is a great dearth at the present moment of first class teachers in scientific subjects. In fact, it is difficult to find in any of the colleges now a teacher who can excite the emulation of the student, or who has actually a large international reputation as an animal pathologist.

A.3335. That is the position in England and I do not think it is very different in the other countries of the Empire. It surely indicates that India ought to pay special attention to training its own men?—I have insisted upon that point in my note; if India wants to develop in veterinary science, it should concentrate its attention on developing its own educational institutions.

A.3336. *Sir Henry Lawrence*: Have you any remedies to suggest?—I have suggested a remedy; it is a tedious one and it may be fraught with many disappointments before the goal is reached. It is analogous to the problem of obtaining the best cattle for the country. With cattle it seems agreed, the best solution, in the long run, of the Indian difficulty is the tedious one of breeding by selection from the indigenous stock. With veterinary matters in India the solution resolves itself similarly into the development of teaching institutions in India to provide ultimately its own men, and in the meantime to recruit the best men it can from any country, at any price, to give their own men a lead.

A.3337. *Sir Thomas Middleton*: In Egypt, in preparing the serum, the first stage of the work is the importation of cattle which are very susceptible to rinderpest. They work up the disease in imported cattle. I take it that no such difficulty is found in India?—We use the Indian buffalo as a serum producer. It is economically a highly productive animal; it has a satisfactorily uniform, moderate susceptibility; we are not likely to meet with the Egyptian difficulties here.

A.3338. Possibly, the Egyptian difficulty to some extent explains the success with which they have met there. It appears to be difficult to infect indigenous cattle with rinderpest?—That may be an explanation, but I am not certain that it is. The cattle are imported there from Cyprus for other reasons. I believe that they are clear of certain prevalent Egyptian diseases when they are imported from Cyprus, and they are used too, I believe, for massive virus production, for the purposes of hyper-immunisation, a process which was entirely abandoned at Muktesar about three years ago.

A.3339. You have alluded to the fact that clinical tuberculosis is rare in India. Is tubercle of the udder rare in India?—It is very rare in India; I have not encountered a case yet.

A.3340. I was glad to see that you were moved by the report of the Development Commission's Advisory Committee to send in a full note to the Imperial Research Conference, to try to correct the impression that was caused in 1921 by their report. I think that probably the report represented the position as it was in 1919-20, and that there has been a change in the interval?—There has been some change in the interval, but I have endeavoured in the lengthy note which I prepared for the Imperial Conference to state that the attention of my colleagues in India has been diverted to other problems than pure research; it has been diverted to the application of certain methods for control of disease.

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I think the point is a very good one and, if I may say so, you have met the case admirably by the memorandum which you submitted to the Imperial Research Conference. I hope they will take note of it.

A.3341. *Mr. Calvert*: In view of the enormous labour involved in any attempt at an India-wide campaign, would you advise a beginning being made on the chief breeding grounds?—We have done that already. We have made our beginning very largely by the application of the method patiently, for the last ten years or so, to the Government military dairies and other large or important breeding institutions.

A.3342. Practically nothing has been done on the main breeding grounds?—No, except in Mysore State where, during 1925, they undertook a campaign on a pretty considerable scale against the disease by simultaneous inoculation in the field.

A.3343. *Professor Gangulee*: Was that confined to the breeding grounds or was it applied to the whole State?—I have no exact knowledge upon the point, but I think it was applied to the whole State.

A.3344. *Mr. Calvert*: Actually, in each Province, there are only two or three areas which are normally regarded as good breeding grounds; if cattle were immunised in these places, there would be a great deal of export of immune cattle to the cultivator?—That would be so.

A.3345. *Dr. Hyder*: You took your B.Sc. degree in the University of London?—Yes.

A.3346. Did you find science students in that college learning German and French?—To become a first class man in veterinary research, it is absolutely essential to know German and French, because the best literature on the subject is in German and French. Without a knowledge of these two languages one is more than half blind in regard to one's capacity for taking note of the current advances in one's vocation.

A.3347. I was wondering whether you had any provision for giving a knowledge of these two foreign languages to the Indian assistants or students under you at Muktesar?—They are encouraged. Of course, we are at the beginning of things in the way of training at Muktesar, and they are being encouraged to learn these languages, and to read all they can in our library on the subject.

A.3348. It is not necessary to become proficient scholars in these languages, but, just as there is a scholar's Latin for various other purposes, it is enough if they have similar knowledge of French and German?—That is so. For the reading of German and French for technical purposes, it is not necessary to know those languages from a conversational standpoint.

A.3349. The name of your institute is the Imperial Institute of Veterinary Research. Am I correct in saying that it is not really a research institute, but a factory on a large scale?—Originally it was intended to be a research institute, but it has become, in regard to its chief aspects, mainly a factory.

A.3350. Is it very much to the credit of the Government of India that its chief research centre should be a factory and not a centre of research?—You put me a very difficult question, because it is rather invidious to criticise the policy of one's Government. The present position is largely the inexorable result of circumstances, for the reason that the chief, and almost the only, demand made by some Provinces has been for products for use in combating disease. If the Provinces had made their demands in some other shape, no doubt the Muktesar Institute would have developed accordingly.

A.3351. As regards veterinary teaching all over India, do you not think it would be a good thing to have uniformity as regards courses and standards of examination?—Yes. I have already discussed that point, and in my note I have stated that there should be a single board of examiners, and there should be an advisory committee.

A.3352. At present there is not?—No.

A.3353. You know the life history of Pasteur?—Yes, I have read it.

A.3354. He was a patriotic Frenchman?—He was a very patriotic Frenchman.

A.3355. You know how he saw good coming out of the oppressions, and he said "If France goes down in the arts of war, I will see that she is made famous in the arts of peace", and thirty years later the whole of Europe gathered at his tomb. What stimulus would you apply to Indians here?—It is rather contrary to the British conception to give vent to such airy thoughts as you have quoted.

A.3356. I do not mean to say that all research work is actuated by the same outlook which Pasteur had. But there are men who are research workers. Either it is the love of truth, of pure science, pure discovery, or some other factor which moves them?—Love of truth, probably.

A.3357. Love of truth, or love of pure science. As regards the engagement of officers by the Central Government, I understand you to say that you would recruit a man on whatever pay was necessary to attract him and you would not recruit him on short-term contract. The inference is that you would advocate the engagement of specialist officers by the Central Government, who should be appointed to individual posts and not to a service. Is that the correct position?—It is rather difficult to answer that question, unless you give a precise definition of what you mean by individual posts.

A.3358. I mean individuals on any pay that the purse of the Government can give them. I understand you refer to the danger of insecurity; the man, if he is engaged on a short term contract, will say "What shall I do after five years". Therefore you are for giving him a long-term agreement and the pay which he is worth?—Yes, he should be given the pay which he is worth.

A.3359. That means that the man cannot be put below a man who has risen from the ranks, although you give him his pay, his increments and pension. That militates against the idea of a service. Are you of that opinion?—Yes. It would create great resentment in the mind of the man who, after all, feels that he has attained a reputation and competence in his pursuit to be put under a man who has climbed up in the course of his service from a position of relative inferiority and relative incompetence to a high position, merely as a result of long service.

A.3360. Does Muktesar claim the credit for Bayer 205?—We claim a great deal of credit for formulating the precise method of employing Bayer 205 in the cure of surra in horses. We claim no credit whatsoever in the manufacture of Bayer 205, naturally. The manufacture in itself, in reality, is not now a matter of secrecy; and it does not seem to be a matter of great profundity; it is a chemical agent, an organic chemical which has been made up according to a certain plan, well known to organic chemists. I am writing a memoir, which is now in the press and is nearing publication, dealing with the subject at some length.

A.3361. Do you think it would be a good thing to revive the defunct *Journal of Veterinary Science* in India?—It would be a splendid thing, if we had the staff necessary for ensuring regular publication.

A.3362. It would be useful from another point of view. You could gather information from foreign journals and incorporate that information in plain simple language?—It would certainly act as a most useful agent if it incorporated reviews and abstracts of publications of importance to India. To some extent this is done by the Tropical Diseases Bureau in the *Tropical Veterinary Bulletin* but this publication has become somewhat inadequate. We want something different rather from the *Tropical Veterinary Bulletin* for our purpose incorporating, particularly, studied reviews of the actual state of knowledge in regard to problems of immediate importance to the veterinary scientist in India from time to time.

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A.3363. I see from your memorandum that your expenditure has gone down since 1922. Is that due chiefly to the recommendations of Lord Inchcape's Committee?—No, though we are now on a self supporting basis. We have actually made more revenue than we have cost the Government in recurring annual expenditure since 1924-25 and the increase in revenue is attributable to a number of factors. First of all, rinderpest occurs in waves of intensity with intervening periods of abatement in intensity. In 1919-20, the demands upon the laboratory were very large but we could not comply with the demands in the then existing organisation of the laboratory. With the cheapening of the costs of production and the transference of crude manufacture of serum to Izatnagar in the plains as the outcome of research, we were able to expand our activities and comply with orders immediately. One knows that if one wants to make a success of business one must comply with orders quickly. When the next wave of intensification occurred, and generally during the last few years, we made strenuous endeavours to meet all demands made upon us by compliance within an average period of five days. The result is that the Provinces have now learnt to depend on us. We have endeavoured, for the same reason, to make a good serum, of uniform potency, not necessarily occasionally of very high potency, but of uniform standard potency, so that field workers get to rely upon the efficacy of our products. These are some of the main factors that have contributed towards the increased demand for serum.

A.3364. You say that the subject of contagious disease should be made a central subject. Would you agree that the direction should be central but that the subordinate agency should be provincialised?—Control of epizootic disease should be central. That means that down to the humblest official the orders regarding control should be executed under central direction. As regards the other matters, that is, dealing with sporadic disease, there is still room for independent local endeavour as I indicated in my replies to Sir Thomas Middleton.

A.3365. There is this difficulty: The subordinate agency might be in the anomalous position of having two masters, one central and the other provincial?—I foresee no difficulty in regard to that. In many administrative problems, I take it that control dwindles down from the Government of India to the humblest officials, so that I do not think that epizootic diseases would be alone in that respect.

A.3366. The *patwari* is the first link in the hierarchy. He is more provincial rather parochial in his outlook. He will carry out orders but he will not know whose orders they are?—In the matter of epizootic disease also, it will not be for the humblest official "to reason why".

A.3367. *The Raja of Parlakimedi*: You say that at Muktesar endeavours are being made to train Indians. What is the intention of imparting that training?—In 1922 we commenced courses at Muktesar, lasting for two years, for training provincial officers for entry into the higher branches of the profession, according to the recommendations of the Islington Commission. In the first instalment of our endeavours we trained six men for two years; and in a second, one. Now the Government of India have decided to keep this training in abeyance. Since then we have taken a number of men in for shorter courses, namely, selected Deputy Superintendents, Veterinary Inspectors and Veterinary Assistants sent to us by the Provinces and Indian States. This year we started lectures at the commencement of the warm weather which were given every evening, and during the day time the men did practical training and associated with the staff engaged in the ordinary work of the laboratory, and every succeeding week we adjusted the course according to the needs immediately ahead. During this year we have also, at the same time, endeavoured to train our own Veterinary Inspectors. This kind of instruction has been pursued as a continuous system which could be picked up readily by new arrivals without detriment through missing any earlier part of the training.

A.3368. Where do these men come from?—Some of these men come up from the Provinces, some from Indian States and some are our own men.

A.3369. What previous qualifications do you insist upon?—We have insisted upon none except that informally we have stated that it is no good sending up men to a place like Muktesar unless their general characteristics are such that they are likely to benefit by the training.

A.3370. After qualifying themselves have these men received encouragement from Government?—Some of them have returned to the laboratories at the headquarters of their Governments and remained there doing technical work. Our experience has been so limited that I cannot give you any general information upon that point.

A.3371. You speak of further encouragement. What further encouragement have you in mind?—We need further encouragement from Government to undertake training of this kind.

A.3372. You think that the men should also be on a higher grade of pay?—That is a general problem. At the present time the rate of pay for entrants into the veterinary services is lamentably low, and one cannot expect educated men to enter a service in which the initial pay is not much more than that of a domestic cook.

A.3373. What grade of pay would you give these men who are entering the Veterinary Department? You complain that there are no teachers available in India. What encouragement would you recommend?—I have already laid down the general principles. You should establish a rate of pay which will attract the best men available; it is difficult to state any definite rate of pay, but the rate of pay must be such as to obtain the best men available, and the conditions of service must be such as to make these men feel secure, without of course making them so secure as to discourage them from further effort.

A.3374. Have you had any opportunity of impressing this view on the Government?—Not as a special case.

A.3375. You say that there are not many first class people in India qualified in veterinary work. I hope that there are a few such qualified men, and, if so, may I know how many Indians may be called first class men?—I think you have somewhat mistaken the impression which I have had in mind. What I think I insisted upon is that the number of first class veterinary pathologists or veterinary research workers, even in the whole world, is extremely small. It would be rather a reflection upon my colleagues in the veterinary services if I refused to call them first class veterinary surgeons.

A.3376. I see; then may I know whether there are any scientific research workers among the Indians who may be called first class men?—No; in fact it is only very recently that Indians have entered this profession. The time is too short to ascertain whether they are likely to be good. As assistants, Indians trained in the Indian colleges have proved all right, and I am highly satisfied with them. But as regards men trained for Class I posts, I may say that at Muktesar I have only had experience of one as a colleague during the last few months and all I can say is that he is promising. I cannot say more except that it takes many, many years to train a man to become a veterinary pathologist.

A.3377. Have you considered the desirability of affording all facilities for the purpose of making Indians first class veterinary surgeons?—They are given every opportunity; in fact they are treated with every consideration, for there is no part of the work to which they do not have access; information, demonstration, everything is given to them freely.

A.3378. You stated that the serum-simultaneous method of injection is carried out on a very large scale in Mysore. Is that done in the same way in British India also?—I said that an attempt has been made, on a fairly considerable scale, to ascertain the value of the method in the Mysore State. Hitherto it has been applied only on a negligible scale in British India; in fact it is only at some of the military dairies and some breeding establishments that we have applied the method.

A.3379. What is the obstacle to carrying it out on a large scale in British India?—The obstacles have been many: among them, in the past

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there has been a great deal of antipathy on the part of the Hindu cattle-owner, particularly towards any method which involved the manipulation of blood.

A.3380. But that has been got over now?—I would not like to say that it has been got over. From conversations with my colleagues I find that people are generally becoming much more enlightened and that they are often now ready to fall in with any method which is to their economic advantage. That is one obstacle; but there have been a number of subsidiary ones. The technique of the method was, in the past, somewhat defective; it has now improved and it will continue to improve further with added experience.

A.3381. Would it not improve the present situation if you had more serum-manufacturing stations?—Of course if one were to apply the method on a large scale in the field it would be necessary to have the serum manufactured locally at every place where the inoculation was performed, and that would be easy. With our present knowledge we have now been able to fix the virus on small animals such as goats. The serum used in the serum-simultaneous method is the same as in the serum-alone, except that we generally recommend a serum of specially high quality.

A.3382. There are no more stations in other parts of India for the manufacture of serum, are there?—The only station at present is the Muktesar station (with its branch near Bareilly), although I believe Mysore State is contemplating the institution of a station of its own in the near future.

A.3383. Would not a cold place like Ootacamund be suitable?—In fact a site has been investigated in Southern India already, near Coonoor. Some years ago when it was thought that Muktesar with its branch near Bareilly would not be sufficient to cater for the needs of India, an officer from the laboratory proceeded to Southern India to investigate the possibility of establishing another site and one was provisionally selected near Coonoor, I believe.

A.3384. Professor Gangulee: And that site is still available?—I believe so.

A.3385. Sir James MacKenna: Assuming that the manufacture of serum were taken up by the Provinces, could you give us any figures as to the cost of installation?—No, it is quite impossible to forecast the cost of an installation. That is a matter which was put to me in a pertinent form a little while ago by Burma. Really, all the necessaries for making the serum are provided when you have one buffalo, one dresser and a bleeding needle together with a glass jar. In the field, in Africa, the serum has often been made in a crude form in this manner.

A.3386. I was thinking of an installation on a somewhat more ambitious scale like the one you have at Muktesar?—That would be possible. Muktesar was started even before rinderpest serum was known, and it has progressed, through various stages of improvement in manufacture, from the original very expensive methods to the present very simple method.

A.3387. The capital expenditure on the installation would not be very alarming, I suppose?—No; in fact it would be cheap. At the present time at Izatnagar we are carrying out our work of manufacturing serum in what is little more than an open field and some plain improvised buildings.

A.3388. Have you had any great demand for serum from outside India?—Not to any formidable extent. We have had some demand from Iraq, sometimes from the Malay States, and also from Ceylon.

A.3389. So that this does not appreciably add to the factory work?—It adds a little: the bigger the outside demand the cheaper is the rate at which we are able to manufacture our serum.

A.3390. What is the present position as regards the out-station at Izatnagar?—At the present time all the crude manufacture of rinderpest and haemorrhagic septicemia sera is undertaken at Izatnagar, and neither serum is made at Muktesar. The serum is then brought from Izatnagar to Muktesar and put through exhaustive animal-tests before it is actually issued to our customers.

3391. Is Izatnagar capable of relieving the factory aspect of Muktesar?—It has relieved already the chief factory aspect of Muktesar. I have found that the execution of large scale manufacturing work and research work side by side are detrimental to each other. If the manufacturing staff, that is, particularly, the menial staff engaged in manufacture, are also engaged partially on research operations, there is the extreme likelihood of the essential manufacturing duties being neglected, to the great detriment of the interests of our customers. At Izatnagar we carry out, now, nothing but the crude factory work of production (of the two sera already mentioned) and the more delicate processes in connection with the manufactured sera are carried out afterwards at Muktesar.

A.3392. Do you think that it would be a good thing to develop Izatnagar to the extent of the scheme outlined by Col. Holmes?—I am not sure about that; one member of the Royal Commission has also asked me about the development of Bareilly as a teaching centre. That can be done, but I find now that it is very convenient to run Izatnagar in its present form, confining the bulkier process of manufacture to Izatnagar, and transferring the finer pieces of work to Muktesar.

A.3393. Have you any views on the statement which has been made that cross-bred cattle are more susceptible to rinderpest?—Yes. I have submitted an article for publication in the *Agricultural Journal of India* the first instalment of which has already appeared and the second of which will appear in the next number, dealing with this matter, and have explained in it the bearing with regard to the acclimatisation of imported stock. We know that the least susceptible cattle in the plains of India are about fifty times less susceptible than pure bred European cattle, judging from the amount of serum that they require for protection. The least susceptible stock in the plains of India are again about eighteen times less susceptible than Himalayan hill cattle, judging again from the amount of serum they require. With cross-breeds their susceptibility seems to run in proportion to the amount of imported blood they contain.

A.3394. Is it a fact that the *Indian Journal of Veterinary Science* disappeared with the abolition of the Inspector-General's office, the Government of India having withdrawn its grant for the purpose?—I think so.

A.3395. What is the relative cost of serum-alone and serum-simultaneous inoculation?—I have worked it out. At the present time for the average indigenous beast in India the serum-simultaneous inoculation, so far as materials are concerned, can be undertaken at a rupee a head, but with the extension of the method it would probably come down eventually to about half the price. In the case of the serum-alone method, with the sale of serum at the rate of three annas for a 5 cc. unit "dose",—and it is generally necessary to give three "doses" to an animal for adequate protection—the cost would be about nine annas, so that there is not a great deal of difference in cost, especially when regard is paid to the relative results.

A.3396. I see that you propose that this inoculation should be free?—I was referring more particularly to the serum-alone method now currently adopted to prevent the spread of disease; but it is a matter for the Government to consider whether it could afford to supply serum-simultaneous inoculations free of charge. Probably it would be too much to expect the State to pay entirely for protection of cattle in that way.

A.3397. Recently the Punjab advertised for a Veterinary Research Officer with a M.R.C.V.S. qualification on a pay of Rs. 450. What sort of officer do you think they would get for the pay they are offering?—I presume you are referring to the post of Professor of Pathology at the Punjab Veterinary College which was advertised some time ago. For that post I understand they got one European applicant and they appointed him.

A.3398. Is it a fact that the profession has been boycotting the service?—The veterinary profession in England?

A.3399. Has the intervention of the Royal College of Veterinary Surgeons on behalf of the officers in India acted as a deterrent to recruitment?—

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No. It is difficult to say to what extent the recent interventions of the Royal College of Veterinary Surgeons on behalf of the officers serving in India has acted as a deterrent towards recruitment of further Europeans, but I understand that the recruitment of Europeans for posts generally in the Veterinary Service in India is now stopped. But subsequent to the War and while recruitment was still open to Europeans, competition for entering the service, among first class men particularly, was very small.

A.3400. The *Raja of Parlakimedi*: In India, which is the more popular, the serum-alone method or the serum-simultaneous method?—The owners were generally against any formal inoculation until recently, so that neither was popular in fact. The efforts of the Veterinary Department were directed largely at first to establishing the confidence of owners in inoculation in any shape, so that hitherto practically the only method adopted has been the serum-alone method, except for the recent large-scale trial in Mysore State and the previous small trials extending for many years, in the military dairies, of the serum-simultaneous method.

A.3401. Are any records maintained of the progress made?—Yes; we have a record of the number of doses issued and the number of animals inoculated by these methods. We also collect figures regarding the reported efficacy of the serum after inoculation. We send officers from Muktesar to undertake the serum-simultaneous method occasionally in selected centres and then make accurate observations, in the field, of the various limiting factors that may accompany its use, for our own information and for prosecuting further research.

A.3402. Does the extension of the method depend upon the work carried out at a certain place?—We go to certain places on request. For example, last cold weather we sent one officer to Assam to ascertain to what extent the disease known as coccidiosis was acting as complicative for inoculated animals and we also sent another officer to an institution in Allahabad where he obtained most important results regarding the supervention of a certain form of piroplasmiasis for the inoculated cattle. These are examples of the kind of mission on which I send out officers occasionally from Muktesar.

A.3403. Are these officers available for private people?—No; I do not think it would be accurate to say they would be available for private owners. It would be the duty of the provincial Government to look after matters within provincial administration, but we may, on occasion send out our men at the request of provincial Governments. We occasionally also send out men at the request of the provincial and institutional authorities, for example to the Presbyterian Mission at Allahabad, for certain purposes.

A.3404. Professor Gangulee: Reference has been made to Muktesar being developed as an educational centre. From your answers I understand that you carry on a certain amount of research there?—Yes; a good deal of research.

A.3405. How do you divide the research work from the factory work?—It is difficult to divide them. Nearly all our factory work connotes research work. I will give you an example: this year research work was directed to finding better means of preserving serum. Curiously enough, we had found that the ordinary carbolic acid preservative does not make the serum germ-proof in India, and the massive multiplication of certain germs, notably so-called diphtheroids, in the serum led us to believe that insufficient preservation was the cause frequently of deterioration in the quality of the serum. We have thus been assiduously investigating for several months better means of preserving the serum and have eventually discovered means, efficacious means we believe, which involve the addition of phenol as well as of a certain acridine dye and a change in the alkalinity of the serum. It would be difficult to say whether this class of investigation should be designated technical research or a simple manufacturing operation. It might well be described in a publication for the enhancement of the repute of an individual as a research worker; but in any event it was really initiated primarily to better the quality of the serum we sell.

A.3406. Do you have special funds allotted to research work?—We have no funds whatever in our budget allotment specially earmarked for research. But from what may be termed savings within our manufacturing budget, we undertake certain classes of research work such as I have mentioned in my note, on surra, tuberculosis and other pieces of work which are not directly remunerative.

A.3407. You solely depend, I understand, on the revenue you yourselves earn?—No; that is not quite accurate. The intention of the Government of India a little while ago seemed to be that we should be run on a self-supporting basis, following upon the recommendation of the Inchcape Committee in 1923. We are given a certain budget allotment, and during the last three years (including the current year) the revenue has exceeded the current expenditure allotment annually by about four lakhs. But we do not depend upon this revenue as it is credited into Government Treasury; we depend upon the expenditure allotment which the Government of India give us each year.

A.3408. Your research expenses come out of that allotment?—Yes.

A.3409. It is not specially ear-marked?—It is not ear-marked in any way.

A.3410. You attach a great deal of importance to veterinary education in this country, and you are in favour of uniformity in the systems of examination?—Yes.

A.3411. And you are also, I suppose, in favour of uniformity in the minimum qualifications for entrance?—Yes, but this principle would be rather difficult to apply because we know that in certain Provinces the prevailing standard of elementary education is higher than in others. I find, for example, that young men who come from Madras are generally better educated than those I obtain from Northern India. It would be difficult to establish a common standard of initial education, but I do not think that the difficulty is an insurmountable one. Without a good basic education it is really useless to attempt to train the men further.

A.3412. In your judgment, what would be a suitable qualification; I.Sc. or B.Sc.?—This is rather difficult to decide. In England the Matriculation examination of a University is generally regarded as quite sufficient as an entrance qualification to any technical institution.

A.3413. In this country the Matriculation standard does not give room for any elementary scientific training?—I believe that in this country the standard of the Matriculation examination is so low that it signifies nothing in the way of a man's capabilities.

A.3414. Do you agree that the Intermediate Science ought to be the qualification for entrance?—I am not entirely familiar with the standards demanded for the Intermediate Science examination, but I should say No.

A.3415. Would you go higher up?—Not necessarily higher up; I would require, for entrance into any scientific occupation of this sort, a satisfactory standard of achievement in what may be called the liberal arts and sciences, that is to say, in the language which the student is to use as his means of precise expression later, mathematics, one or more foreign languages, and one or more optional subjects such as are demanded, say, for the London University Matriculation examination.

A.3416. Then, you would have a selection board, I suppose?—I think after passing an examination which would be of the same standard as the Matriculation examination of a reputable British University, it would not be necessary to select men further, although one knows that for veterinary work generally, it is better to have men who have been brought up in close contact with agricultural pursuits.

A.3417. You suggest a four years' course; is that the period you would recommend for all the provincial veterinary colleges?—I would suggest four years as the minimum requirement of training for the higher veterinary work in this country.

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A.3418. Is the central standing advisory committee to which you make reference, concerned with research work, or is it purely for education?—As it was recommended at the 'Meeting of Veterinary Officers in India' in 1923, it was for education only. There was to be another committee for research.

A.3419. You say that the Government have not taken any action on the recommendation of this committee?—I believe the recommendation has been circularised among the Provinces, but orders of Government upon it have not yet been passed.

A.3420. There is no such standing advisory committee now?—There is no such standing committee now in existence.

A.3421. Then, do you think a similar committee should be formed to advise the Government in matters of research?—Well, it was stipulated then; but at the present time it would be extremely difficult to form such a committee, for it would be an easy matter to constitute a small committee, as things now stand, the numerical strength of which would exceed the total number of available research workers in India.

A.3422. Who is going to advise the Government of India in veterinary matters?—I have said in my note that the only solution to this big problem in India is centralisation of control of epizootic diseases, the enactment of legislation to deal with this class of disease, and the appointment of a competent staff to operate this instrument.

A.3423. Reference has been made to the veterinary conferences. Do you still hold the conferences?—No. The last veterinary conference was held in 1923. I communicated recently on the subject with the Government of India asking their intentions for these conferences, according to their previous orders, were to be held every two years. They are now, it seems, awaiting the report of this Commission before they decide to take any further steps.

A.3424. In that case, what is the present organisation through which you are in touch with the Provinces?—There are the official demands for serum, and as regards technical matters I am in touch with them personally or semi-officially. Whenever we make some discovery at Muktesar that may be of general interest and capable of ready application, we communicate it to the Provinces.

A.3425. *Sir James MacKenna*: You consider the regular holding of these conferences as of very great importance to the department?—I do not know whether I could rightly employ superlatives in such a connection, but frequent intercourse among technical workers for the discussion of technical matters is plainly of a high importance. I find now certain of my colleagues complaining that, except for occasional communications with persons situated like myself, they do not meet with any other veterinary people for long periods. They meet, ordinarily, people whose interests are entirely outside those of their profession, and after the lapse of years and after the vicissitudes of service and administration they lose touch with professional interests, and, of course, as you will readily realise, that is fatal to the development, or even retention, of any pre-existing technical competence.

A.3426. *Professor Gangulee*: Supposing you desired to know what were the causes that were responsible for, say, a recent outbreak of rinderpest in the Madras Presidency, and you wanted to investigate its incidence, have you any agency through which you could get information yourself as Director of Muktesar Institute?—In a way, there is a channel of communication. When you ask me a question of that sort, I can recall an important matter on which I wanted light a few years ago. That was in connection with the periodicity of rinderpest. I asked the Veterinary Adviser to the Central Provinces Government to give me charts of incidence for as far back as he could give me, similar to the ones he was then publishing in his annual reports and he generously and willingly gave me the information that was accessible to him.

A.3427. At what age is serum-simultaneous inoculation effective?—We have applied the method to calves as young as a few days old, and we have found that immunity on such animals after undergoing the so-called "blocked out" type of reaction lasts for nearly three years and then wanes, so that age is no deterrent. In the past we have advised that animals should be inoculated as young as possible. There was a technical reason for giving this advice in the past; cattle when young are highly resistant to clinical piroplasmosis, so that the younger they are done the better. But now that we propose recommending the use of cleansed goat virus, this factor is a secondary consideration.

A.3428. Does the duration of immunity depend on the breed?—We do not know yet. As I said some time ago, the impression we had until recently was that the immunity was lifelong, especially from the Egyptian records. But it has recently transpired in our serum work at Muktesar that the immunity of calves is not lifelong; it lasts in a solid form for two years, and then wanes.

A.3429. Irrespective of the breed?—We have carried out our work on cross-bred calves, mostly, as also on a small number of calves of some indigenous breed, but the numbers are too small to furnish valid results on relative breed susceptibility.

A.3430. Do you contemplate sending some one to Egypt to see the conditions there and how they have achieved their results?—I do not think they could teach us very much. From their literature, their methods are in accordance with the old standard teachings. In India, we have gone beyond that stage a good deal and have evolved methods which are, at least, applicable to the special material procurable for use in the country for the manufacture of serum.

A.3431. The scheme that you have developed in your note of evidence on the question of the control of contagious diseases is purely an Imperial one; that is, the direction of control and the subordinate officials necessary to carry out the orders would be all under the Imperial Department?—I have indicated in my note that for the proper control of contagious diseases of animals it is necessary to have a single control within the widest possible geographical limits; therefore, that is synonymous with Imperial control.

A.3432. What would be the relation of the officers already working in the Provinces with the officers belonging to the centralised organisation of control?—I think I have said in my note that as regards the application of measures for the control of contagious diseases they should execute the orders of, and be subordinate to, the central technical authorities.

A.3433. You said, on the question of serum-simultaneous inoculation, that the cost of the materials would be about one rupee. Do you think it would be reasonable to expect the Government of India to distribute the serum free of charge in order to popularise the serum-simultaneous method?—I am not so sure about it. I have consulted some of my colleagues in the department on the question as to whether any considerable reduction in the cost of the serum would bring about a greater use of the serum, and some of my colleagues have said No: that the main difficulty is the staff that they can get from provincial budgets, for applying the serum. Others have said that the serum would be used more if it was cheaper. Of course, it is our duty at Muktesar to make it as cheaply as possible, and to recommend to the Government to sell it as cheaply as possible.

A.3434. Your statement there refers to serum-alone inoculation?—Yes as I am only able to hazard an opinion regarding the operating of costs in the light of experience in the issue of the serum for employment in the serum-alone method.

A.3434(a). That is, after all, useless?—I would not say that it is useless. I would modify it by saying that in the past it has been used with good effect in certain circumstances, and especially when it has been applied in conjunction with standstill orders so far as they can be applied.

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A.3435. On page 20 you speak about the great livestock problems of the country, animal husbandry, veterinary and dairying, as forming a group which can well be differentiated from the vast number of agricultural subjects. In order to carry on investigation on the question of animal husbandry, would you have one central station where all these problems would be tackled, or would you have separate stations?—Naturally, I should have separate stations in regard to problems like animal husbandry. You could not, in a central place like Muktesar alone, or in conjunction with a station on the plains, undertake the enormous problem of animal husbandry.

A.3436. I was thinking of animal nutrition, animal genetics and animal diseases?—Yes. Probably a great central teaching institution might develop eventually to teach all these problems, but not carry out comprehensive research into all aspects of the several problems.

A.3437. You see the correlation even in matters of research?—There is a striking correlation. At the veterinary school which I attended for some time in France they had taught for many years the subject of zoo-techny, which comprises genetics and to some extent animal husbandry, as a special subject in the curriculum of the veterinary student, and the teacher, at the college is one of the greatest European authorities on this particular subject. The German and American schools are now making a bid for incorporating this problem of breeding and husbandry also in the veterinary curriculum, and there has been a movement recently in this direction in England.

A.3438. You are in favour of starting the new journal in order to collate the information relative to veterinary problems. Which authority is going to publish it?—Already the Government of India subsidise agriculture to the extent of publishing the *Agricultural Journal of India*.

A.3439. There the Agricultural Adviser is the editor?—Yes, the Agricultural Adviser to the Government of India is the editor of that journal.

A.3440. Who is going to be the editor of the journal that you propose?—It may be anybody, provided he has the necessary standing and competence, corresponding to the Agricultural Adviser to the Government of India, in the Veterinary Department, and presumably if the scheme of organisation I have suggested were adopted it would be the Director-General of Veterinary Services.

A.3441. The Agricultural Adviser would not be a suitable editor?—No.

A.3442. Mr. Kamat: With reference to your answers to some of my colleagues on the question of an Adviser to the Government of India and central control, I would like to know whether you are postulating that the appointment of such an Adviser is necessary because there would be an All-India enactment for the control of contagious diseases?—The official I have suggested there is not an Adviser, but a Director-General, a man with executive powers; and without the enactment of legislation, it is the general experience of countries wherein the problem of the contagious diseases of animals is taken up seriously that there is no instrument for effective control. Such an individual would not be an Adviser, but a person with powers like those of the Chief Veterinary Officer of the Ministry of Agriculture at Home, appointed to operate the Diseases of Animals Acts (1874, 1895).

A.3443. In other words, you postulate that an All-India enactment is necessary and that this appointment of Director-General will be an executive one?—Yes.

A.3444. For central control?—Yes.

A.3445. On the analogy of other All-India enactments, take, for instance, the Indian Penal Code. May I ask if, to enforce that, you require an Inspector-General or a Director-General in Delhi to see that the enactment is enforced in all the Provinces?—The cases are not similar, because when a crime is committed against the Indian Penal Code, it does not spread from Province to Province like a contagious animal disease.

A.3446. Taking into consideration the vastness of the distances in this country, you think that a centralised officer in Simla or Delhi can control and can see to the enforcement of the Act throughout the length and breadth of all the Provinces, simply because the nature of the case is contagious?—I quite appreciate that the problem is an immense one, and so far as I can see, and having in mind the analogies and experiences of other countries including countries which are run on a federal basis, I can see no other way of starting effective control. As I have said already, these questions have taken a century and a half to solve in their present manner in Europe, that is to say from the time of the establishment of the Lyons School about 1780.

A.3447. To take a concrete case: Do you think that such an officer sitting in Simla would be able to do anything if there was an outbreak, say, in Pagan in Burma?—Supposing there was an epidemic in Burma, the officer would have behind him the Cattle Diseases Act and with the authority of that Act he would frame orders and regulations for the detailed control of the epizootic. The local veterinary authority in Burma would then apply measures of control in accordance with the specific regulations drafted under the Act. If the measures should appear to fail in their effect, their application would come under the investigation of higher officers until eventually the matter would come to the notice of the Director-General, himself, if the failure should appear to warrant his personal investigation. This is a problem which is familiar to workers in all countries which have a proper system of control of epizootic disease.

A.3448. Do you think the idea of this appointment should be kept in abeyance until such an All-India enactment is passed?—The sooner the organisation is created the better, for the reason that Government, in contemplating the legislative measures necessary, would require close expert guidance.

A. 3449. If you visualise a Director-General for the Veterinary Services, there must also be, I presume, some one of similar status on the agricultural side?—I have envisaged in my scheme a Bureau of Animal Husbandry such as they have in the United States of America, where the whole problem of livestock is controlled by one bureau subordinate to the Ministry of Agriculture. There would probably be a Bureau of Soils, a Bureau of certain crops, a Bureau of Insect Pests and other bureaux such as they have found necessary in the United States of America. The livestock problem, with breeding, dairying, animal disease and similar matters, however, forms a composite subject which can well be separated from the other agricultural problems.

A.3450. Under this scheme would the Dairy Expert at Bangalore be under your Director-General?—Not necessarily under him. He might be a colleague working under the chief of the Bureau of Animal Husbandry who would be a veterinary or a livestock man.

A.3451. *Professor Gangulee*: The Director-General would come under the bureau?—Yes. In the United States of America the bureau is at present controlled by Mohler who happens to be a veterinary man.

A.3452. *Mr. Kamat*: Under this scheme, the Director-General has not only the function of administering the All-India Act but also of regulating the research work conducted by different organisations in the country?—Yes. The research work conducted would be such as was relevant to existing field problems.

A.3453. In other words, you want to give control to the Director-General in two matters. One will be punitive with reference to the All-India enactment and the other will be the regulation of research?—The application of measures of control of disease are not necessarily punitive.

A.3454. Call it application of the Act if you like?—Both these matters will be under him.

A.3455. With reference to the question of co-ordination of control would you be satisfied, if such an appointment were created, that the func-

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tions of that officer should be only co-ordination short of control?—No. I would not be satisfied with that; we must have control. I do not exactly know what co-ordination means. If there is to be no centralisation, I cannot understand what co-ordination would mean. In some Provinces the officer might be welcomed perhaps, by the local officers: it would depend upon various factors such as the personality of the man, his professional competence, the degree of help he is prepared to give, and so on.

A.3456. Do you think that it is indispensable that the control should also be central?—It is, in my view, indispensable that the control should be central.

A.3457. Do you think that the emoluments offered to veterinary assistants at present are sufficient to attract the right type of men?—I have already replied in answer to another member of this Commission that the initial pay given at present to the members of the subordinate veterinary services is often not much more than that given to a domestic cook.

A.3458. What increase of pay would you suggest?—It is rather difficult to say. The experience of the medical profession would probably serve as a guide. The degree of training required of a veterinary officer is not, in reality, short of that required of a medical man. The medical authorities may be able to guide us in regard to what they consider as sufficient inducement to attract the right type of man. At the present time the salaries are too low.

A.3459. It has been stated that the co-operation between the Muktesar Institute and the Provinces is not exactly what it should be. Do you agree?—That is rather a difficult question to answer. As matters stand, we are complying from Muktesar with all the requests made for products for inoculation. We are asked for technical advice too and that advice is freely given.

A.3460. There seems to be a lack of eagerness to ask for technical advice. What is that due to?—It is due to lack of cohesion. The fact is that the higher technical officers are engaged mainly in so-called administrative work. They come but rarely into actual contact with disease and diseased animals.

(The witness withdrew.)

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Captain W. F. Q. SHULDHAM, I.A., Assistant Commissioner,
Ajmer-Merwara.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(a) (i) No research work of any kind is undertaken in Ajmer-Merwara and we have no institute.

I am fully aware of the fact that this is a small Province and that it probably of itself cannot bear the financial burden of a research institute. But research work is of such tremendous importance that I venture to suggest that it might be possible to establish one at Ajmer for the whole of Rajputana, financed partly by the Indian States and partly by Ajmer-Merwara. Surely such an institute would be of inestimable value for the whole of Rajputana, and cheap at the price.

It might also be considered desirable to include Delhi in this scheme, though I most strongly advocate the location of the institute at Ajmer in view of its central position, and the fact that the area of Ajmer-Merwara is 2,711 square miles while Delhi is only 557 square miles.

(c) No investigation is being made, in Ajmer-Merwara, as to whether it is possible to combat disease which attacks the local cotton.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(a) The cultivators will only adopt improved methods when they have seen them with their own

eyes, and have been convinced that financial benefits will accrue to them if they renounce their old methods. Cultivators in the proximity of our one model farm are not slow to learn, and anxiously await the results of experiments with any new form of seed and implement.

(b) Ajmer-Merwara is a long straggling Province and two more Government model farms are required, one in the vicinity of Ajmer and one near Kekri.

In addition to these, cultivators in various villages should be induced to cultivate according to the methods found most suitable at the model farms, using the seeds and implements recommended. These holdings should be supervised by the superintendents of the model farms. As soon as the other cultivators in these and surrounding villages see and learn that the cultivator who has followed the recommendations of the superintendent has made more money out of his holding they will be eager to follow suit.

(c) I consider that if the cultivator who farms his holding under the supervision of the superintendent is guaranteed against loss, the ryots will only be too anxious to secure and adopt expert advice.

QUESTION 4.—ADMINISTRATION.—(a) In view of the fact that Ajmer-Merwara is directly under the Government of India, I consider that the Central Government's experts should take a direct interest in this Province, and visit it periodically to advise the local staff and ensure that we are working on the right lines. At present the Government of India do absolutely nothing for us, and we require their assistance badly.

(c) (i) 1. The Agricultural Service in this Province is totally inadequate— as a matter of fact the staff consists of one superintendent of the model farm.

Ajmer-Merwara is a very small Province, an enclave of British India in the centre of the Indian States of Rajputana. No other Province wishes to have any connection with it in regard to technical subjects, nor is it desirable that they should, in view of the geographical position of this Province.

The Province and its Agricultural Department and institutions should serve as a model for all the Indian States round it, and not be permitted to drift on in its present backward state, starved of funds. We have no Minister of Agriculture to look after our interests and, as nearly all proposals from this Province which involve fresh expenditure are looked upon with disfavour, it has been regarded as merely waste of time to submit schemes which are scrutinised by an official, who probably knows nothing about agriculture or our needs and is merely faced with the nightmare of having to justify the expenditure before the Standing Finance Committee.

If we are to progress at all, the Government of India must recognise that Ajmer-Merwara requires an adequately staffed agricultural department with its own budget and that the present haphazard activities carried on with the help of the District Board must be supplemented by the Government of India. Ajmer-Merwara could then move forward, and it is then far more likely that all the States would follow suit, take a lively interest in agriculture, and emulate our activities. Further, the Chiefs' sons are educated at Mayo College, and they could be shown, whilst at the college, the benefits which would accrue to their States by adopting new methods.

2. In my reply to Question 1 (a) (i), I have recommended the establishment of a research institute for Delhi, Ajmer-Merwara and Rajputana at Ajmer. It is also quite possible that both Delhi and the Indian States of Rajputana might like to benefit from, and co-operate in, the formation of an agricultural department in Ajmer-Merwara by securing the advice of the head of the department in the case of Indian States, and direct supervision in that of Delhi.

This would of course involve contributions on the part of the Indian States as well as on the part of Ajmer-Merwara and Delhi, but they would not be heavy, and it would in any case be the cheapest method they could employ for getting expert advice.

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3. The head of the department should be an officer of the Agricultural Service.

4. The present local staff in Ajmer-Merwara should be increased from one superintendent to three, so that two more demonstration farms can be opened in this scattered Province. These superintendents would also tour in the villages, giving advice to the cultivators and supervising holdings run on modern lines.

5. In addition we require an agricultural mechanical engineer who can be responsible for all the machinery and implements to be adopted, and supervise the installation of pumps, etc. He will require a small foundry for repairs and the manufacture of shear heads for ploughs, etc. At present we have no expert at all to consult.

6. Veterinary Service.—If three more veterinary centres are opened at Kekri, Nasirabad and Todgarh as suggested in my reply to Question 16 (a) (i), three additional Veterinary Assistants will be required, and a Civil Veterinary Officer should be in charge of the whole Province. There would be ample work to justify the latter appointment, as there are a great many horses in the district, especially in Ajmer and Nasirabad and the Istimrari area. At present the nearest Veterinary Officer upon whose service we can call resides in Karachi and only visits Ajmer once a year for a couple of days.

(iii) I am far from satisfied with the services afforded by the roads in this Province. This is not the fault of the District Board, which spends every penny it can possibly afford under this head. But the fact remains that many of the roads are in the most deplorable condition, with the result that carts are broken and the bullock strained and forest produce can only with difficulty be transported to the markets.

It is, however, a fact that the Government of India have been extraordinarily stingy in the matter of roads in Ajmer-Merwara. There are two main roads which have been taken over by them, and are recognised as Imperial roads. Yet they require the District Board to subscribe Rs. 4,984 per annum to their upkeep. It seems to me that either roads are Imperial or not, and that it is grossly unfair to burden the District Board in this manner. This sum of Rs. 4,984, though a mere flea bite to Government, would be of great value and assistance to the District Board.

(d) The local selected cotton is attacked by wilt disease in parts of the Province, but it has been demonstrated at the model farm that American Buri cotton is immune from this disease. This year, one landowner who has sown Buri cotton, on land where the wilt disease was so bad last year that the whole of his crop was destroyed, has a bumper crop and has already returned to the farm and asked for as much Buri seed as he can obtain from us for next *kharij*.

QUESTION 5.—FINANCE.—(a) The first thing to do is to extricate the cultivators from their indebtedness to the *banias* by long-term Government loans at low rates of interest. When this has been accomplished agricultural operations should be financed entirely by the co-operative society and *taccavi* loans.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(a) (i)—

1. Famines and scarcity.
2. The expenses incurred in connection with the marriage ceremony.
3. The *mosar*, a feast given at the death of relations.

(ii) The sources of credit are:—

- (1) The village *banias*.
- (2) Co-operative societies loans.
- (3) *Taccavi*.

(iii) Every second or third year there is either famine or scarcity, and it is impossible for the cultivators to repay the principal sum and the accumulated interest thereon out of the produce of one or two good crops.

(b) (1) It is hoped to facilitate the redemption of mortgages by applying the Punjab Redemption of Mortgages Act to this Province. At present many mortgages date back to the very severe famines of 1868-70 and 1898. The mortgager has not the vaguest idea how much he really owes the mortgagee, and the latter declines to render an account lest he should lose his hold over the land.

(2) I am of opinion that the only way to extricate the cultivators from their indebtedness is for Government to advance long-term loans at a low rate of interest to them through the co-operative societies, who will ensure that such loans are utilised for the redemption of mortgages and the payment of debts.

(c) At present no cultivator is permitted to sell his land or mortgage it for more than twenty years without the sanction of the Collector, under the Land Alienation Act. I do not consider that any further measures are desirable.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(b) The consolidation of holdings in Ajmer-Merwara is a very difficult problem, and I fear that little can be done. The rainfall is so scanty and the supply of water from wells so unreliable that cultivators could never be induced to exchange a portion of their holding, where the water supply is assured, for another bit of land where the water supply is precarious.

It is possible that something might be accomplished as regards *abi* and *talabi* lands by the co-operative societies, but there is not much fragmentation in such lands.

QUESTION 8.—IRRIGATION.—(a) (ii) Ajmer-Merwara is subject to famine about every fourth year and during those years every possible tank and pond for storing water have been constructed. Nothing more could be achieved in this respect.

(iii) 1. I am of opinion that there is still room for improvement in well irrigation.

2. A pumping set is shortly to be installed at the model farm, and when it has been demonstrated to landowners and they have appreciated the increased area that can be brought under irrigation thereby, it is believed that pumps will be installed in the district. There are, however, only a limited number of wells that can bear a pump.

3. In the *khalsa* area it is doubtful whether there is room for any more wells of the kind that now exist. In the *istimrari* area there undoubtedly is, but it is not possible to interfere in that area without altering the revenue regulations, and ensuring security of tenure to owners of wells.

4. Recently, in the vicinity of Beawar a boring machine has been at work with a view to supplement the water supply of the city. These operations have met with some success, and I consider that certain parts of the district should be explored in this manner to ascertain whether there is not an underground supply of water available which could be utilised for irrigation. I have several areas in my mind, notably the Saraswati, Khari and Dain rivers.

These operations must however be undertaken by Government, at any rate in the first instance, as too much capital will be involved to leave it to private enterprise.

QUESTION 10.—FERTILISERS.—(a) 1. It has been proved that hemp is a most excellent manure, when grown and ploughed into the land. Last year we manured two adjoining plots with hemp and cowdung, and sowed wheat in both plots. The crop grown on the hemp-manured land was the heavier.

2. Bone manure is not used nearly as much as it ought to be, and it is for the co-operative societies to encourage their members to collect all bones in the villages for this purpose.

(c) The best method to encourage the use of hemp as a manure is by demonstration, and this should be one of the chief tasks of the agricultural staff when holdings are being farmed under their supervision.

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(e) I do not consider that these methods have received sufficient investigation in this Province, but until we are given an adequate staff we cannot do it.

(f) This question is, to my mind, bound up with the provision of an adequate and cheap supply of firewood and charcoal in the villages, and until this can be achieved it is not possible to expect the villagers to abstain from using cowdung as fuel.

The Forest Department have made great strides recently in this respect, but, until the District Board have sufficient funds to construct better roads to the edge of the forest area, progress will be limited.

QUESTION 11.—CROPS.—(a) (i) 1. Cotton.—The cotton in the Province can be greatly improved. We have now selected the best local variety and are growing it at the model farm. It gives a greater outturn and higher percentage of lint than the other local varieties. It is a question of time and putting a larger area under this selected cotton so that we can distribute the seed throughout the Province. This local selected cotton is, however, attacked very severely by wilt disease in some areas, and we are experimenting with American *Buri* cotton which is so far immune from the disease.

2. The wheat, barley and *juar* crops can also be greatly improved, and we are pushing forward with our demonstrations.

3. Chillies can also be improved.

(ii) 1. Groundnut is a very paying crop, and we are endeavouring to encourage the cultivators to take it up.

2. Tobacco is being experimented with at the farm but it is too early yet to say whether it will prove successful in this soil or not.

3. Potatoes are shortly to be tried in the hilly tracts of Merwara.

(iii) The distribution of seed is at present in its infancy and not working at all smoothly. But it is obviously the duty and one of the most essential tasks of the co-operative societies to take this in hand.

The *banias* do not stock the really good seed, and when they do they adulterate it and sell it to the cultivators at the higher price which the good seed fetches.

(iv) Much damage is caused to the crops by wild pigs which infest the hills throughout Ajmer. The only way to get rid of them is to conduct an organised campaign against them. This will have to be done by Government, as the villagers are quite incapable of doing so themselves.

(e) I have already mentioned the introduction of American *Buri* cotton into the Province. One striking instance has occurred this year at a village called Bhaonta, proving its value as a substitute for the local selected variety. Last year a landowner sowed local cotton which was completely destroyed by wilt disease, and he came to the model farm for advice. He was given some *Buri* cotton seed which he sowed on the same land and has been rewarded by a bumper crop this *khari*.

QUESTION 12.—CULTIVATION.—(i) The most important immediate improvements in villages that I can suggest are—

- (a) the use of modern ploughs,
- (b) the sowing of cotton in lines,
- (c) the use of weeding machines,
- (d) the use of hemp as manure.

QUESTION 14.—IMPLEMENTS.—(a) This Province is very backward in the use of modern implements.

Its immediate needs are:—

- (1) Replacement of the old wooden plough by the modern plough.
- (2) The introduction of weeding machines for the cotton fields.
- (3) Installation of pumps at wells where there is a sufficient supply of water.
- (4) Threshing and winnowing machines.

(b) There can be no question that the quickest and most successful method of hastening the introduction of improved implements is to demonstrate their value at the model farms, and holdings in the villages. This must be supplemented by keen and practical propaganda on the part of the co-operative societies' officials.

(c) 1. At present we have to import from Bombay all ploughs required for the Province, as well as all other forms of agricultural machinery and implements except weeding machines. The demand is now only just beginning to develop, so that the firm we deal with in Bombay can have no idea of our future annual requirements; otherwise, if we were able to give a large order in bulk at the beginning of the year, they might be able to reduce their prices.

2. We have failed to get ploughs made in the Province, as the local foundries do not seem to be able to mould one satisfactorily.

3. We have however succeeded in getting weeding machines turned out in the Province with the result that the cost of the large and small kind is Rs. 4-4 and Rs. 3-4 respectively, compared with Rs. 27-8 if we were to purchase the machine in Bombay.

This shows what could be achieved if we could only get the ploughs produced locally as well.

QUESTION 15.—VETERINARY.*—(a) I consider that, for the present at any rate, the Civil Veterinary Department should remain independent.

(b) (i) The dispensaries are under the control of the District Board but, should they be extended, I consider that the Veterinary Department should be directly under the Commissioner.

(ii) The need for expansion will be adequately met if my suggestion to open veterinary dispensaries at Nasirabad, Kekri and Todgarh is adopted.

(c) (i) Agriculturists make good use of the dispensaries in areas where they know the Veterinary Assistant personally and appreciate his usefulness. This will be rectified in the other areas if other dispensaries are opened.

(ii) We have no touring dispensary at present, but the Veterinary Assistant is sent to different parts of the district according to requirements.

(d) 1. The great difficulty in dealing with contagious diseases is for the Veterinary Assistant to reach the affected area in time. The Province is such a scattered one that information reaches headquarters very slowly, and even then it is necessary to send to Karachi for serum. So that frequently when rinderpest breaks out (and this disease is very prevalent in the hilly tracts) many of the animals are dead before the Veterinary Assistant can do any good by inoculation.

2. I do not consider that the cultivators are ready for legislation in regard to compulsory inoculation and prohibition of movement of animals, but I think legislation is necessary to cover the destruction of carcasses of animals which have died from disease, and to hold *lumbardars* responsible for cutting the hides to prevent removal after burial. *Patwaris* should receive instruction, during their training, in recognising common dangerous diseases amongst cattle, and they should be ordered to report direct to the nearest Veterinary Assistant instead of through the usual channels in the case of an outbreak.

If a microscope could also be provided for Ajmer, the delay in sending slides for examination to Karachi would be obviated.

(e) There is no difficulty in obtaining sufficient serum, but it has to be sent for from Karachi and I recommend that a thousand doses should always be kept in stock at Ajmer.

(f) There is no difficulty in popularising preventive inoculation, provided no fee is charged.

In Ajmer-Merwara the District Board found themselves bound to levy a fee of four annas per head inoculated as they could not possibly afford to pay the whole amount themselves, viz., one rupee per head. The result has been

* See Appendix, Mr. Jerrom's replies, page 58.

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a very decided falling off in the numbers inoculated, and in some cases total refusal to have the cattle inoculated.

(g) I do not consider that this is necessary in Ajmer-Merwara, provided we remain under Karachi as at present.

QUESTION 16.—ANIMAL HUSBANDRY.—(a) (i) Nothing is being done at all to improve the breeds of livestock.

My recommendation is that veterinary centres should be established at Ajmer, Beawar, Kekri, Nasirabad and Todgarh where a good bull or bulls should be kept, and also rams. Side by side with this, the co-operative societies should carry on propaganda for the castration of bulls in villages.

I have recently persuaded some *Seths* at Beawar, who have a *gowshala* with some two hundred cattle, to purchase three bulls, and I am now in correspondence with Karachi on the subject. The *Seths* have undertaken to exclude all other bulls from their *gowshala*.

(ii) The question of betterment of the dairy industry is bound up with the improvement of the breed, which has already been discussed in my reply as to the provision of fodder for milch cows in times of scarcity, which are of so frequent occurrence in the Province.

At present the cattle have to be sent off to Malwa in times of scarcity, and only at rare intervals receive proper nutrition.

(c) May and June are the months in which fodder scarcity is most marked in Ajmer-Merwara, and scarcity lasts for about eight or nine weeks, provided the rains break towards the end of June or beginning of July.

Young growing cattle begin to thrive some ten days after the young grass appears.

(d) A scheme is now under consideration, and will shortly be submitted to the Government of India, for baling and storing sufficient grass in years of plenty to meet all demands in times of scarcity. The work is to be undertaken by the Forest Department in areas under their control, and we should in a very short time have a reserve of 100,000 *maunds*, apart from the reserve supply in villages and the *istimrari* area.

This scheme, if sanctioned, will be of the greatest value, and I venture to urge that its acceptance should be strongly recommended. It will provide grass for the villagers at a reasonable rate, and save Government large sums of money expended on railway concession rates when grass is imported to meet a fodder famine.

(e) The best way to induce landowners to take a keener interest in these matters is for experts to be continually touring in their villages and assisting them in every possible way. An agricultural show should be held in the Province.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(c) There may be considerable possibilities in the hilly tracts of Merwara for the development of fruit growing, especially peaches and plums.

It is, however, impossible to say definitely until we have the necessary staff and funds to enable experiments to be carried out. A much better motor service will be necessary to enable growers to market their fruit in Beawar and Ajmer.

QUESTION 20.—MARKETING.—(d) I consider that it would be most useful if complaints as to Indian produce could be placed at the disposal of the cultivators through the Agricultural Department and co-operative societies.

QUESTION 24.—ATTRACTING CAPITAL.—(a) At present no land can be sold to any person who does not belong to the agricultural classes. This restriction should, in my opinion, be removed in the case of men with capital at their disposal, especially if they can be induced to build houses for themselves in the country and live on the land. The increased use of motor cars by well-to-do Indians and the security in the country districts should gradually lead to a desire to live in the country, and this should be encouraged.

(b) In my opinion, the size of the holdings and indebtedness of the cultivators in Ajmer-Merwara is the greatest factor in preventing the adoption

of improved methods. The very small holder cannot afford to buy new implements, and if he obtains a greater outturn by using improved seed it is the *bania*, in whose debt he is, who reaps the benefit.

APPENDIX.

Replies to the Questionnaire submitted by Mr. J. H. G. Jerrom, I.V.S., Superintendent, Civil Veterinary Department, Sind and Rajputana.

QUESTION 15.—VETERINARY.—(a) The Civil Veterinary Department should be independent.

(b) (i) The Ajmer Veterinary Dispensary is under the control of the District Board while the one at Beawar is controlled by the Beawar Municipality. This system is not satisfactory.

(ii) There has been no expansion in this department for very many years. Ajmer-Merwara Agency with a cattle population of 360,260 and an area of 2,711 square miles, is served by two* dispensaries, one at Ajmer and the other at Beawar, which are in charge of Veterinary Assistants. Owing to expense, no systematic touring is carried out and the Veterinary Assistants leave their headquarters only when they are sent for by the owners of sick animals or when an outbreak of contagious disease is reported.

(iii) I am of the opinion that dispensaries should be under the control of the provincial authority in Ajmer-Merwara. If this is not feasible, the Veterinary Assistants should certainly be under provincial control and given a graduated rate of pay. At present, Veterinary Assistants have no standard rate of pay; it depends upon the finances, etcetera, of the local body.

(c) (i) No. The Ajmer dispensary is very little used by agriculturists. The Beawar dispensary is better patronised by comparison with Ajmer, but the total attendance is very small. More dispensaries are urgently needed; a large proportion of the population of Ajmer-Merwara have never heard of a veterinary dispensary. Propaganda work by touring Veterinary Assistants and the local authorities are the only means of remedying this.

(ii) There are no touring dispensaries. Three years ago I put up a scheme for the employment of itinerating Veterinary Assistants for Ajmer-Merwara but owing, I understand, to lack of funds, the proposal was not sanctioned.

(d) The chief obstacles are:—

1. Ignorance of the people.
2. Failure of local authorities in promptly reporting outbreaks of contagious disease.
3. Objections of the people to having their animals either inoculated with preventive serum, or, in outbreaks of glanders or surra, to having the animals destroyed.
4. The influx of cattle (often disease carriers) for grazing from surrounding Indian States, none of which have any organisation for dealing with contagious diseases. Legislation would certainly be of immense value in controlling outbreaks of contagious disease but such control would be very expensive and, at present, owing to the ignorance of the majority of owners of animals, very difficult to enforce. More dispensaries and systematic touring of Veterinary Assistants will improve existing conditions and enable the people to appreciate the benefits which the Veterinary Department can give them.

(e) There is no difficulty in obtaining sufficient serum.

(f) The chief obstacle is that a large proportion of cattle owners of Ajmer-Merwara have never heard of preventive inoculation and, until its value is

* Mr. Jerrom suggested, in forwarding his evidence, that one new dispensary, either permanent or touring, should be established at *Kekri* and one at *Todgarh*.

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demonstrated to them, cannot be expected to avail themselves of this means of protecting their cattle. No fee is charged and it would not be practicable in this Province.

(g) Yes.

(i) I would advocate the extension of the Muktesar Institute.

(ii) Provincial veterinary research institutes working in conjunction with the Muktesar Institute might be started in the larger Provinces.

(h) I would recommend that special investigation should be conducted, by officers of the Muktesar Institute in the smaller Provinces, and in the larger Provinces by their own officers.

(i) Yes. The whole service would then be co-ordinated under one head. The Superior Veterinary Officer could outline a policy for the whole of India.

Oral Evidence.

A.3461. *The Chairman:* Captain Shuldham, you are Assistant Commissioner, Ajmer-Merwara. We have the note of evidence which you have submitted. Do you desire, at this stage, to make any statement in amplification of that note?—There are two things I should like to mention. We have really nothing at all in Ajmer and that is our complaint. We have no help of any kind from anybody. The District Board allots about Rs. 5,000 a year, with which sum we run one model farm, and that is for all our experimental work and growing seed for distribution to the cultivators. As a matter of fact, the Government of India have just allotted a sum of Rs. 7,000 for opening another farm and providing two other Superintendents. That is really the first assistance that we have had, and this assistance has been given us only in the last six months. We have got no research institute to which we can refer any of our problems, nor have we had any expert visiting the Province. We have no agricultural department. We have so far got one Superintendent and it seems very essential that something should be done for the Province. What the local authorities would like is a research institute to be located in Ajmer, and, if possible, the funds should be found partly from Ajmer; and further, if it is possible, to interest the Ruling Chiefs in Rajputana so that they may feel disposed to contribute towards the institute, the Ruling Chiefs could derive just as much benefit as Ajmer would, because Rajputana covers no small area.

A.3462. Would you tell the Commission, quite shortly, what the system of administration is in the area for which you are speaking to-day? There is a Commissioner at the head, is there not?—Yes.

A.3463. With whom is he in direct touch?—The Agent to the Governor General in Rajputana.

A.3464. And, in his turn, with whom does the Agent to the Governor General correspond?—He corresponds with the Political Secretary to the Government of India in the Political Department.

A.3465. Under the existing system of devolution according to which the Government of India has no direct responsibility for the machinery designed to deal with the detailed administration of agriculture, to ask the Government of India to be responsible for agricultural matters in Ajmer-Merwara might appear to some persons to be like asking the Master-General of Ordnance to be responsible for the cleaning of the rifles in any particular battalion. Do you think that the Government of India is equipped for the business of detailed agricultural administration?—We think we ought to have our own agricultural department in the Province to deal with our problems.

A.3466. Meantime, has the Government of India got the officers or the staff required for work of that sort?—I imagine they will have to be recruited. I do not know what they have got in the North-West Frontier Province.

A.3467. In the ordinary Provinces in India, the work which you wish to see undertaken in Ajmer-Merwara is being undertaken by provincial author-

ities; you have no provincial authorities, and the Government of India is apparently none too well-equipped for carrying on any particular work in the territory. Where do you suggest that there could be found, in the employ of the Government of India, officers capable of conducting research institutions or of staffing an extensive agricultural department, in Ajmer-Merwara?—I do not think I have asked for an extensive agricultural department. There would be an officer in charge of the agricultural department and under him would be superintendents.

I am trying to discover whether there is any flaw in the principle which saddles the Government of India with responsibility for detailed administration over certain small territories, for which, in fact, it is not equipped?

A.3468. Have you any reasons to suppose that the Indian States would be prepared to contribute towards the cost of a provincial research station?—In Central India they do contribute towards the Indore Institute, and I see no reason why the Rajputana States should not agree to contribute.

A.3469. If such a station could be started, do you think that the Director of the station might act as Agricultural Adviser to the Chiefs who support it, in the same way as the head of the Indore Institute acts as Agricultural Adviser to certain Chiefs?—Yes; I think so.

A.3470. You say there is nobody to whom you could refer your research problems. Have you ever referred any particular research problem to Pusa?—No; I do not think we have referred any problem to Pusa, but we get our wheat and barley seed from them. We have from time to time written to the Central Provinces, Indore, the United Provinces and the Punjab asking for advice.

A.3471. Do you think it might be worth while sending a particular problem up to Pusa and asking them to render you the assistance required?—Yes; but they do not know the local conditions of Ajmer-Merwara.

A.3472. That is no doubt a sound objection as regards certain problems, but not as regards all; there are certain problems which are not purely local?—I agree; we do ask for seed.

A.3473. *Sir Henry Lawrence*: You have obtained your wheat seed from Pusa?—We have obtained wheat and barley seed from Pusa.

A.3474. *The Chairman*: In answer to Question 10 (a), you refer to the use of bone manure. Is there any strong prejudice against its use?—No. The collection involves too much trouble.

A.3475. There is no caste prejudice against it?—None.

A.3476. You suggest on page 55, that one of your immediate needs is the introduction of weeding machines for the cotton fields. Is cotton cultivation carried on by large cultivators or small?—Both.

A.3477. Do you think the small men would be able to pay for the weeding machine?—Yes. We have manufactured two kinds, a larger size and a smaller size, costing Rs. 4-8-0 and Rs. 2-8-0 respectively. They save more than that in one year in labour. They were invented by the Superintendent of the model farm.

A.3478. On page 54 you touch on some of the possibilities of developing irrigation from wells. Have you sunk wells in the *mofussil*?—They have been trying to bore a well in the city of Beawar for the purpose of supplementing the water supply of the city. The work was started two years ago. Since then we have had adequate rains, and it is rather difficult to state what the result has been. They started the boring operations when there was water scarcity.

A.3479. There has been no attempt to tap the sub-soil water in the rural areas?—None.

A.3480. In answer to Question 14 (c) you say: "At present we have to import from Bombay all ploughs required for the Province as well as all other forms of agricultural machinery and implements except weeding machines". That is to say, all your demands?—Yes. As a matter of fact we now get iron ploughs from Bombay and can deliver them to the cultivators at Rs. 21, which means a good deal of reduction from the previous rates. Wooden ploughs, of course, are all made locally.

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A.3481. In answer to Question 15 (b) (i) you say: "I consider that the Veterinary Department should be directly under the Commissioner." It really amounts to saying that the Veterinary Department should be separated from the Agricultural Department and the senior veterinary officer should be responsible for it?—At present it is under the District Board, and it should be separated from the District Board.

A.3482. You mean the dispensaries? You say they should be taken away from the District Board?—Yes, and put under the Commissioner. As a matter of fact the Commissioner is the chairman of the District Board.

A.3483. Does the District Board show any signs of taking any interest in veterinary matters?—They do; but they are very badly organised. The Veterinary Assistants get their pay from the District Board and there is no regular scale at all. We could not extend their activities from the funds at the disposal of the board.

A.3484. The Veterinary Assistants are paid by the District Board?—Yes. There is only one Veterinary Assistant.

A.3485. Do you think the District Board is poor because they have not got the assets to tax or because they do not want to tax?—They have not the assets to tax; we have recently increased the taxation; it is a poor Province.

A.3486. On page 56 you are dealing with certain steps which you think ought to be taken to prevent the spread of contagious animal diseases, and you say: "I think legislation is necessary to cover the destruction of carcasses of animals which have died from disease, and to hold *tumbardars* responsible for cutting the hides to prevent removal after burial." What is the practice at present? Are the carcasses dug up and skinned?—Yes; that is what happens now.

A.3487. Is the difficulty to find fuel to burn the carcasses?—No.

A.3488. Would not the burning of carcasses be a better way of disposing of them than burying?—Yes.

A.3489. Would there be any objection to burning?—No.

A.3490. That would altogether prevent the removal of hides?—Yes.

A.3491. Has there been any administration of the serum-simultaneous method of inoculation against rinderpest?—No, not so far as I am aware.

A.3492. In answer to Question 16 (d), you describe a scheme for baling and storing sufficient grass in years of plenty to meet all demands in times of scarcity. Is it proposed to store for two seasons a crop of hay, or anything of that sort, and then to sell off the balance year after year?—We get a grass famine every two or three years; we would indeed be lucky if we did not get one every third year. The scheme is to store up the grass for two years to meet the scarcity of the third year.

A.3493. Who is actually going to do the grass cutting?—The Forest Department, as it does now.

A.3494. What are communications like in the area?—The roads need improvement, especially in the forest area. It is a matter of great difficulty to get the fuel to the market and make it available to the villagers. The District Board cannot spend any more money on the roads. They ought to be improved; they are very bad in Merwara and in the hilly tracts, and in some of the other parts of the Province. A railway line from Nasirabad to Deoli is also badly needed, and I believe that matter is under consideration. There is a lot of cotton grown there, and there are a certain number of ginning and pressing factories at Kekri, which is 35 miles from the railway.

A.3495. Have you formed any view as to whether the co-operative movement in the tract is sound?—It has not been run on sound lines in the past. Loans were issued far too freely, and very little enquiry was made as to the financial soundness of the cultivators. But within the last three or four years the officer in charge of that department has worked extremely hard, and certainly the co-operative movement is far sounder now than it has been in the past.

A.3496. Have you ever attended any meeting of a primary society?—No. So far as I was concerned, it was only a question of presiding over some

function or other; I have not attended an actual meeting where they have gone into details.

A.3497. Have you formed any view as to whether the cultivators who are members of primary credit societies understand much about co-operation?—I do not really know about that.

A.3498. Is there anything that you wish to add to that which is already before the Commission in the matter of the Land Alienation Act which is in force in Ajmer?—Only what I have said in my note. I think that in cases where you have got men with capital and who wish to farm the lands themselves and live on the land, the Land Alienation Act should not apply. Of course, they do not belong to the cultivating classes.

A.3499. *The Raja of Parlakimedi*: Which is the nearest agricultural research station to Ajmer?—I should think Indore.

A.3500. Have you placed this difficulty of the cotton pests from which Ajmer is now suffering before the Indore station?—No, we have not.

A.3501. Is this cotton disease spread all over the Province, or is it confined to a local area?—It is far worse in some areas than in others.

A.3502. Why have you not consulted the Indore station in this matter?—We have not got the right to apply to them for anything.

A.3503. Can you not even seek friendly advice?—The only way we can do it is to write to them unofficially; we cannot do so officially. In Nagpur they know that we are suffering from this wilt disease.

A.3504. Have you approached any of the cotton stations for technical advice?—We are now working on a local selected cotton, which is giving a very much better outturn and a higher percentage of lint, and we are trying to distribute pure seed to the cultivators. We are doing that ourselves through our own model farm.

A.3505. Have you approached any of the cotton stations for the eradication of the cotton wilt disease?—No. I do not think that anywhere in India they have found out a cure for cotton wilt disease. I am not an agricultural expert, and I do not pretend to be, but I do not think that that has been done.

A.3506. As regards the research station in Ajmer which you wish to have, have you approached the Chiefs?—They were approached about ten years ago.

A.3507. What was their attitude?—Rather more than half of them, perhaps seventy-five per cent, were in favour of it; there were a few who refused.

A.3508. Is any practical example set by any contribution or anything like that?—That is a matter between the Agent to the Governor General and the Chiefs, and so I would prefer not to reply to the question.

A.3509. *Professor Gangulee*: You say "We have no Minister of Agriculture to look after our interests, and as nearly all proposals from this Province which involve fresh expenditure are looked upon with disfavour, it has been regarded as merely waste of time to submit schemes which are scrutinised by an official who probably knows nothing about agriculture"?—Yes.

A.3510. Ajmer is under the Central Government?—Yes.

A.3511. Do you not send any scheme to the Agricultural Adviser to the Government of India?—No.

A.3512. Who supervises the work of the Superintendent of the model farm?—The Assistant Commissioner, who probably has not got much knowledge of agriculture. He may be in the district for three months or two years. He may personally be extremely keen on agriculture, and the next man may not.

A.3513. *Sir James MacKenna*: You have been transferred yourself?—Yes. Just as I was getting a real interest in it and getting the projects working, I was transferred.

A.3514. *Professor Gangulee*: There is no contact with the Central Government at all in the matter of the agricultural development of the Province?—No.

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A.3515. In the note given to us by another gentleman from the Province, he says that the drink evil is steadily on the increase among the agriculturists. I want to know from you whether that is correct?—I should think it is quite the reverse amongst the cultivators. I was also Collector of Excise, and our policy was to increase the price of liquor to the highest possible extent, having in view the fact that we are surrounded by Indian States where the liquor is sold at a low price and is of double strength.

A.3516. You are in touch with the District Board?—Yes.

A.3517. You say that the District Board spends every penny it can possibly afford on roads?—Yes.

A.3518. You have two main roads which are recognised as Imperial roads. Who pays for the upkeep of these roads?—With the exception of Rs. 4,984, the Public Works Department pays for it.

A.3519. Could you tell this Commission why the Imperial Government wants this contribution of Rs. 4,984 from the District Board?—I think they originally maintained a portion of it. As far as we are concerned, there is no reason why they should demand this payment.

A.3520. Instead of helping the District Board, the Imperial Government takes the money from the District Board?—Yes.

A.3521. *Sir Henry Lawrence*: The district is, I understand, about 2,700 square miles in extent with a population of half a million?—Yes.

A.3522. You say there is lack of funds and lack of administrative staff compared to other areas controlled by the Government of India, for instance, the North-West Frontier Province?—Yes. They are given as much money as is required.

A.3523. Do they get the administrative staff from the Government of India?—I believe they have got a most excellent Agricultural Department with farms and seed distribution arrangements. That is what I gathered merely from conversation with officers who have served on the frontier. The present Commissioner served on the frontier, and I understand from him that they got anything they wanted.

A.3524. Do you regard yourself as the Cinderella of the Government?—Absolutely.

A.3525. *Sir Thomas Middleton*: The Cinderella has got one model farm?—Yes.

A.3526. From where did you get Mr. Joshi, the Superintendent?—He came from Nagpur.

A.3527. You have got an improved selected cotton?—Yes, and with very good results. The mills are giving two rupees a maund more for our local selected cotton than for other varieties.

A.3528. Was the selection work done by Mr. Joshi?—It was largely done by him, from what he had learnt at Nagpur. While on this point, I may inform you that there was an idea to instal a pump for increasing the area under cotton in the farm from twenty-five to sixty *bighas* with a view to have more improved seed available for distribution, but because the scheme is going to cost Rs. 1,000 more than originally estimated, it is, I am told, being shelved.

A.3529. By the District Board or by the Commissioner?—By the District Board, as they cannot provide the extra Rs. 1,000, and the result is that an extra 150 maunds of cotton seed will be lost which should have been available to the cultivator.

A.3530. Are they very keen to get that selected seed?—They are very keen on it. They storm round us to get it and the American *huri* cotton in cases where the local selected cotton is attacked by wilt disease. I have mentioned in my note the instance of a landowner who has sown *huri* cotton on land where the wilt disease was so bad in one year that the whole of his crop was destroyed. He came to the farm for the *huri* cotton seed, and he had a bumper crop the next year.

A.3531. Where did you get the American buri cotton?—That came from Cawnpore.

A.3532. You have a regulation which prevents a cultivator from selling his land or mortgaging it for more than twenty years without the sanction of the Collector. Have you heard complaints, since this regulation was introduced, that the cultivators could not get credit?—I have never heard complaints of that nature. As a matter of fact, it is probable that a great deal of land selling is going on without the officials knowing it.

A.3533. On what basis does the Collector give permission?—The condition is that the land should only be transferred to a member of the cultivating classes.

A.3534. You mention that your seed distribution scheme is not working at all smoothly. What is the trouble due to?—I am told that this summer it has been working much better. The trouble has been that we have had no sort of organisation to distribute seed to the cultivator. It is being done through the revenue staff at present. It is not really a satisfactory way of doing it. I should be in favour of doing it through the co-operative societies.

A.3535. Have you been getting complaints that the seed you distribute is bad or does not germinate?—We have never had a complaint of this nature. As a matter of fact, we have only just started it.

A.3536. In connection with the hay storage scheme, how is the hay stored during the monsoon? Are the stacks protected by thatching?—Yes. We have a very scanty rainfall too.

A.3537. You get about thirty inches, do you not?—We had that amount this year. We have some trouble with white ants.

A.3538. You referred to the restrictions on selling land. Do you think that these restrictions should be removed, so that if a man wants to take up land and improve it, he should be free to do so?—I think we ought to encourage that.

A.3539. If a man of the right type came up, would he be refused permission to purchase by the Commissioner?—As a matter of fact, a case like this came up a year ago. The officers fight out the case if they consider it a good one, but the Commissioner might take a different view.

A.3540. There has been no general ruling that, where occupation by another man is in the public interest, permission to sell or buy should be freely granted?—No. It is left to the Commissioner's discretion.

A.3541. *Mr. Calvert*: On the last point, apparently you restrict sanction to cases where the purchasers would build houses and live on the land. How would you ensure permanent compliance with that provision?—If a man puts his money in buildings and in other improvements, he will not be inclined to give it up. Even if he is not there, he will get an experienced farmer to run it for him.

A.3542. Have you come across a case where a non-agriculturist has done it?—I have known a case of a barrister in Ajmer. His son was managing it for him.

A.3543. Is it farmed by the barrister himself?—By his son.

A.3544. What is the area, do you know?—About a hundred *bighas*.

A.3545. You do not fear that there will be absentee landlordism?—I think it is worth trying to attract capital to the land.

A.3546. You do not think it has been tried sufficiently throughout the length and breadth of India?—Probably you have more experience than I have. My point is that every effort should be made to attract capital to the land; at present, capital is sorely needed in Ajmer.

A.3547. Is your Land Alienation Act the same as the Punjab Land Alienation Act?—I think we follow the United Provinces model.

A.3548. Is it the same as the Bundelkhand Act?—I have not a copy of that Act.

A.3549. Do you require sanction even if the transfer is to another agriculturist?—Yes; it is a formal sanction; it is never refused.

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A.3550. In connection with the installation of pumps, is there a large area with a sufficient supply of sub-soil water?—There are wells in the beds of various tanks where you could undoubtedly instal pumps. You could also instal them along the Khair river which runs a considerable way. There are also the Saraswati and Dain rivers. In the Makrera farm when water is being drawn from the well for twelve hours a day we find that the water the following morning is at the same level as it was the previous morning. It falls about twelve inches or so during the day.

A.3551. The main trouble is that there is so little water?—Yes.

(The witness withdrew.)

**Mr. BAL KISHAN, Registrar of Co-operative Societies,
Ajmer-Merwara, Ajmer.**

Replies to the Questionnaire.

QUESTION 2.—AGRICULTURAL EDUCATION.—(iii) There is no arrangement for agricultural education here. My replies under this head apply to general education and are based on my experience as a co-operator. I have not tackled the questions under the head of General Education as the local educational officers will be the proper persons to deal with them.

The only condition I would put on a rural school teacher is that he must be popular with the persons among whom he is required to work. An adult class is a necessary appendix to all rural schools and a teacher who cannot run an adult class successfully may be considered a failure, whether he belongs to an agricultural class or not.

(vi) There are only one-half per cent literates among the agricultural classes in rural areas, according to the last census figures of 1921. The lads of agriculturists can be induced to take to education if more schools are provided in rural areas and the school time is made more suitable to the requirements of poor agriculturists whose every child is an asset for earning bread and who can ill afford to lose him for the whole day from his agricultural work.

My experience of a few schools for juveniles which I started under the control of the Co-operative Department shows that if the school building is a bit distant from the village, that is a hindrance in the attendance of the boys of cultivators.

More literacy among them will mean less cheating of agriculturists by their creditors, less litigation and their taking to improved methods of agriculture more easily, thus increasing their income and profits. Literacy among the agricultural classes is the point to which I attach the greatest importance in making any effort to improve their economic condition. I would go so far as to make education compulsory for them, with certain restrictions which I will express in the last paragraph of my reply to Question 6 (b).

(xii) 1. The Co-operative Department can help in popularising adult education in rural tracts by forming adult education societies, providing a supply of trained teachers for the purpose, and sufficient funds for the conduct of the schools for the first one or two years after their formation till they are taken over by the Education Department, when expert supervision by the education staff will be guaranteed and a curriculum suited to their needs and tastes drafted by experts according to the local conditions.

2. Adult classes should be started in every rural school, *vide* my reply to Question 2 (iii). We should not aim at literacy only but should impart real education in these classes in an interesting manner. This means supplying trained teachers. I would try newspaper reading by the teacher to the adults, shows of magic lantern slides on matters pertaining to their profession, explaining the results of agricultural research by charts and graphs in the matters in which they are interested. I would also suggest, in order

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to popularise these classes among the villagers, that there should be discussions on hygiene and sanitation and instruction in morals and the advantages of wholesome food and decent dwellings.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(c) 1. In every village one or two persons should be induced to cultivate a field or two of each crop on the advice of, and with the seed supplied by, the agricultural staff of the district. By this method the expert advice will be adopted and followed more readily by the cultivator, if the results are satisfactory, and will reach the farthest corner in a comparatively short period.

2. Better farming co-operative societies can serve the same purpose. They should be encouraged by being given a separate Government-paid expert staff in agriculture when a good number of such societies are established.

3. Propaganda in this district for literate persons may be undertaken by printing and distributing leaflets written by experts on agricultural subjects, and for illiterate people by organising demonstrations and magic lantern shows and by exhibiting charts and diagrams of the results achieved by the Agricultural Department in the very villages and among the very people who are intended to be influenced. This should be done preferably in the adult classes attached to rural schools which I have advocated in my reply to Question 2 (iii).

4. Agricultural plots under the management of school teachers and cultivated by improved methods should be attached to every rural middle school, and senior students should do manual labour on the farm and study agriculture as a vocational subject. This will mean having an agriculturally trained man on the staff of all such schools and the establishment of an Agricultural Department here, there being none at present.

Spasmodic demonstrations away from the homes of the cultivators in a centralised village do not leave any lasting impression on the cultivators, who have to be constantly impressed with the superiority of improved agricultural methods at their own door, i.e., in the village itself.

The co-operative organisation can help in promulgating the new ideas among the agriculturists if it is kept well informed of the activities of the Agricultural Department. This means co-ordination of both the departments, which I strongly advocate. The peasant is not so conservative as he is often thought to be. He is not unwilling to adopt improved methods but these must be shown to be capable of giving better results. In order to induce the peasants to adopt the improved methods the experts must prove, not on paper but by actual farming on their fields, that these are paying and are suitable to the conditions under which the cultivators live.

QUESTION 5.—FINANCE.—(a) The Government should adopt a liberal policy towards the extension of the co-operative credit movement among the agriculturists by providing expert staff and even by giving cheap money if required. Co-operative credit can provide satisfactorily both long and short term credit to cultivators, short term through co-operative credit societies and long term through co-operative mortgage banks. It is for the latter only that the Government might have to give money in the beginning. The movement has already reached a stage when it does not require Government money to any great extent for short term loans. To attract funds for mortgage banks the Government will have to create confidence in the investing public by taking the initiative either by subscribing to debentures or giving a guarantee of interest on the debentures issued by these institutions to secure long term money.

The following are the five agencies by which agricultural operations are, or can be, financed:—

- (1) Individual moneylenders,
- (2) Joint stock banks,
- (3) Agricultural banks,
- (4) Government,
- (5) Co-operative credit societies.

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Of these agencies, I advocate co-operative credit as being most suitable for agriculturists because,

- (i) in a co-operative society the interests of the borrower and lender are harmonised,
- (ii) the liability being unlimited ensures that the minimum amounts for the shortest periods for productive purposes will be advanced and that proper supervision will be exercised on applications and repayments,
- (iii) the area being small, strict watch and control over the doings of the members is possible, bad characters will be excluded and this will indirectly improve the moral condition of the agriculturists.

1. The *sowcar* is undesirable because he takes into consideration the *hasiyat* of the borrower only, irrespective of his character, industry and honesty, advances loans liberally for unproductive purposes, within the limits he considers safe and does not give facilities for repayment because it does not pay him to do so. The above are great inherent defects in the *sowcari* system, apart from the excessive interest the *sowcar* charges and the irregular account-keeping in which he may indulge.

2. Ordinary banks and companies would not care for this business because they prefer the short term investments which the nature of their funds requires. They can be of little use to the cultivators. Being situated in towns away from the borrower, they cannot remain in touch with his requirements and can neither supervise the advances nor be sure of punctual repayment. The security which such a class of *clientèle* can offer also does not give them satisfaction. This is all in addition to the trouble, expense and waste of time which the agriculturists will have to incur by dealing with them.

3. Most of the objections cited in the above two systems are present in the agricultural or land banks.

4. I would not advocate advances for agricultural operations direct through Government, because:—

- (i) for an industry in which seventy per cent. of the population of India are engaged, the Government cannot provide adequate funds;
- (ii) Government can find out only through the official staff what are the necessary requirements and what are the least amounts by which they can be met, which enquiry is not always satisfactory;
- (iii) the borrowers cannot be trained in business matters, the idea of self-help and the practice of thrift,
- (iv) some pressure might be required to make recoveries, which would bring the Government into disrepute;
- (v) last of all, it would be mere philanthropy on the part of the Government and philanthropy never reforms a borrower.

(Most of the matter for the above reply is taken from Mr. Calvert's note on "Credit" and my experience of the last eleven years in this work supports the views expressed above.)

(b) The system of *taccari* can only be made popular if advanced through an organisation of the borrowers and not to individuals. The difficulties experienced in obtaining small sums and in making his repayments at *tahsil* headquarters are too numerous for a small agriculturist living in a far off village. His ignorance, illiteracy and poverty add to his difficulties when he has to pass through so many Government offices such as the *tahsil*, the Treasury and, in some cases, the Imperial Bank of India. In my opinion the only organisation which can make fuller use of the system is the co-operative organisation. It can correctly gauge the requirements of the borrower and his capacity to repay at each harvest. If the Collectors use their discretion liberally in interpreting the word "scarcity" and allow

taccavi advances freely to co-operative societies when applied for, a lot of money can be usefully employed through the societies for the benefit of the agriculturists.

For those who have not yet joined the co-operative societies I cannot think of any way by which they can take more advantage of the system. We will await their admission to the societies. During the last famine *taccavi* was given to central co-operative societies here for distribution to their members at the rate at which it was advanced by the Government. The facility given was very much appreciated by co-operators and the money was on the whole profitably utilised by them. The practice proved so popular that new members joined the societies on seeing the ease with which co-operators got loans for necessary purposes.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(a) (i) Agriculture has been aptly described as the "trade of the year to come". Ajmer-Merwara is a peculiarly situated Province; it is extremely liable to the ravages of years of scarcity, famine and shortage of fodder, and this is the biggest cause of borrowing here. Other causes are:—

- (a) the zamindars are not thrifty and prudent and their profession is such that they require credit to carry it on;
- (b) the villagers are heavily loaded with old debts which have descended from father to son for the above reasons; whatever little income they get goes in the payment of interest on old debts and they have to borrow again for their maintenance and to carry on their work of cultivation for the next crop;
- (c) being illiterate, they cannot find out if the profession in which they are engaged is paying or not and they go on borrowing irrespective of its economic results;
- (d) social customs and high marriage expenses are the other purposes for which they borrow, as the returns from the industry in which they are engaged, under the present circumstances of borrowing from individual money-lenders and practising agriculture by primitive methods, are not such that they can save for these social purposes from the profits of the trade.

(ii) (1) The original system of financing the agriculturists in this district, as everywhere else, is through the individual moneylender who belongs to the professional moneylending classes.

(2) The profession of moneylending in such a backward tract and among so docile a people as we have here is considered to be so lucrative that everybody, in whatever walk of life he may be, wants to invest his savings in lending money to the agriculturists if he gets a chance, and once this side business is started he becomes a landlord in a surprisingly short time.

(3) Since 1910 co-operative credit societies have provided credit to about 10,020 members who owed Rs. 16,54,877 to 483 societies at the end of the year 1925-26.

(4) Shop credit is another source and a very ruinous one. In shop credit the borrower fails to realise that if the shopkeeper lets him buy goods on credit, he does so because it pays him better to do it than to insist on cash payment for every purchase. It also prevents the zamindar getting the best price for his produce, for when he is involved in shop credit he is morally bound to take his produce to his shop-keeper who credits it in his account, allowing whatever rate he considers best.

(5) The moneyed zamindar is also a source of credit to others. No regular enquiry is being made in this Province to ascertain reliable figures as to the debt of the zamindars. Whatever data are available for making an approximate estimate of these debts are given in paragraphs 11 and 12 of my pamphlet* on "Agricultural Conditions and Rural Economy in Ajmer-Merwara".

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(iii) The reasons preventing repayments are:—

- (1) series of bad crops owing to defective and scanty rainfall and want of perennial sources of irrigation;
- (2) failure to get the best out of the land for want of expert agricultural advice and training;
- (3) the individual system of moneylending, the interest of the moneylender being to recover always the interest on the investment and to keep the principal outstanding, so as not to diminish the source of his income;
- (4) the old high indebtedness of agriculturists which has brought in its turn despair and despondency, with the result that there is left no incentive to them to grow more, make more profit and get relieved of debt, as they consider the position hopeless;
- (5) owing to absence of education they are not able to keep account of the borrowings from and repayments to their creditor and investments and returns on their profession;
- (6) the drink evil among the agriculturists is steadily on the increase and absorbs a lot of their income.

(b) The measures in force here to achieve the end in view are:—

- (1) The Usurious Loans Act of 1918.
- (2) The Land Alienation Regulation of 1914.
- (3) The Talukdars Relief Act of 1911.

The Usurious Loans Act has proved ineffective as an instrument for lightening agriculture's burden of debt, the professional moneylender being too shrewd for it. It failed to achieve its aim because the courts cannot re-open any agreement and scrutinise it more than six years after the date of the transaction in dispute, and, moreover, the courts have not the time and inclination to go through the dry and tedious accounts. The transactions here are mostly old and *mahajans* get them renewed periodically, showing the balances as cash advanced. Under Order 26, Rule 11, of the Civil Procedure Code a few committees were formed here by order of the District Judge in 1920 under the name of "Janch Committees" so that whenever the courts have any doubts about the account and interest charged in a money suit, they may send the case to one of these committees concerned with the circle, for them to go through the accounts in dispute, arrive at an equitable and just amount and make a report. A copy of these rules is herewith attached.* They have not had a fair trial as yet. The main points which have stood in the way of their success are:—

- (a) that the considered opinion of the committee does not have enough weight with the court and is brushed aside on any new plea which the creditors may raise there. The plaintiff should be asked to put the whole case before the Janch Committee and not to keep back any account, though previous to the limit of six years, for which the committee ask;
- (b) the plaintiffs are always reluctant to appear before the Janch Committees. If they fail to do so, this should go against them in the decision of the case.

The Land Alienation Act is in force and is doing useful work in preventing permanent alienation of land and in the redemption of mortgages effected after its introduction. There is no facility for redemption of older mortgages. Zamindars are too poor, resourceless and illiterate to indulge in protracted civil litigation for redemption of such mortgages if they so desire. The provision of section 83 of the Transfer of Property Act also does not give relief to any appreciable extent, because the mortgagees always shows unwillingness to part with his paying mortgaged lands and then the court feels helpless to give the necessary relief to the agriculturist.

* Appendix II.

Therefore some special measure on the lines of the Punjab Redemption of Mortgages Act of 1913 is necessary here.

The Talukdars Relief Act is applicable only to those zamindars who are landholders of special kinds, that is, *istimrardar*, *jagirdar* and *bhomia*. (Copy of the Act attached.)* In my opinion this should be extended to all who wish to take advantage of it, provided (a) the applicant satisfies the Government that he has resources to carry on his industry after he has availed himself of the provisions of this Act to clear his old debt, and (b) that the transaction will be to his economic gain, i.e., the profits from the industry are sufficient to repay the instalments of the loan under this Act as also the instalments of *taccavi* if it be given him to carry on his business.

2. The measures I would suggest for adoption are:—

- (a) To amend the Usurious Loans Act to make it more effective and to provide therein for reference of the accounts to committees if the court has not time to go through all the accounts.
- (b) A redemption of Mortgage Act on the model of the Punjab Redemption of Mortgages Act of 1913.
- (c) Some sort of Act to regulate account-keeping by persons engaged in moneylending with the agriculturists. Its necessity is clear from my reply to Question 6 (a) (ii).
- (d) The extension of the Talukdars Relief Regulation to all agriculturists, with proper safeguards, or the enactment of a similar regulation for the benefit of agriculturists who have proprietary rights in land.

3. As for the special measures necessary to deal with rural insolvency, I attach a copy of the suggestion† made by Mr. Calvert in 1921 for this Province on this subject. The scheme has not yet been tried here. Insolvency proceedings can be resorted to by highly indebted peasants if the clause as to giving a discharge certificate to the insolvent is relaxed, if the requirement of the law, as it stands at present, that the debtor shall not be discharged until a certain percentage of his liabilities are paid from his income, is not insisted on, and if the claim of the future creditor is given priority on the crops raised by means of his money.

As for the Usurious Loans Act, the courts should utilise the services of Janch Committees more freely [paragraph 2 (a) *supra*] and their decision should be given due regard by the courts. If the right sort of person is not forthcoming to work honorarily as a member of these committees, I would pay a small sum for each case from Government funds.

As to facilities for redemption of mortgages, I have nothing to add except that a new law, by which mortgages older than 1914 may be redeemed by summary procedure, should be enacted.

4. Another great factor in the high indebtedness of agriculturists is the heavy expenditure on social customs, viz., death and marriage feasts, and the drink habit. The low percentage of women as compared with the male population of the district means a high value on women who are an asset in the practice of agriculture here. Propaganda and education are needed to remove these defects and when the people are ready I would advocate social legislation on these points and prohibition of drink.

The infusion of elementary education on a system more suitable to the agriculturist will affect the debt question to a great extent. It will teach him to keep accounts of his money transactions and of his profession and will enable him to see that he is not cheated by those with whom he deals. I would suggest compulsory education, the opening of enough schools in rural areas within easy approach, even of a boy of six or seven years, in each village, and modification of the curriculum and school time-table to suit the needs of agriculturists so that education may not drive the boy from his industry but may make him a better man for his industry. To

* Appendix III.

† Appendix IV.

ward off the objection of agriculturists of this comparatively poor district to compulsion in education I would suggest that the schools as regards time and session should be suitable to their requirements, be within easy reach, and the attendance at school of only one male child from each family should be insisted upon.

(c) The Land Alienation Regulation Act has been in force here since 1914. No difficulty is experienced to my knowledge by the agriculturists in its application. It prohibits non-terminable mortgages.

QUESTION 7.—FRAGMENTATION OF HOLDINGS.—(a) To prevent the loss in agricultural efficiency attendant upon the excessive sub-division of holdings there is a provision in Ajmer Land and Revenue Regulation II of 1877* that mutation may not be effected if it is observed that in any partition of land the area thus sub-divided falls short of ten *bighas* of *chahi* and thirty *bighas* of *barani* land to each share-holder. But this cannot effectively stop fragmentation owing to the law of inheritance and the fact that the section does not lay down that the area shall be in one block. Moreover, though the revenue authorities may not entertain the partition application, this does not preclude the civil court from taking cognisance of it.

QUESTION 8.—IRRIGATION.—(a) (ii) The tanks serve their purpose well if they get filled, i.e., if there is average rainfall in smart showers. The utility of existing tanks may be improved if the arrangement of the tank is left in the hands of a committee of villagers themselves rather than leaving it, as at present, in the hands of the officials at headquarters, a system which often causes delay in the supply of water owing to official red-tapism.

(iii) The obstacle to getting enough water from wells for irrigation, and the hindrance to their extension, is that they depend for their water supply on tanks or streams and the latter in turn depend on rainfall. Therefore, if the rain, which in itself is a notoriously uncertain factor, fails all the sources of water supply fail, and famine stares the agriculturist in the face. The second obstacle to their extension is the hard rocky soil through which the wells have to be dug here.

I recommend the establishment of a small Government well-boring department to explore subsoil water and secure a permanent supply of water in wells, if possible. The department could also make experiments with tube wells. The staff could also find out the best and cheapest method of blasting the rocks which appear just on the surface when one digs a well, through which one has to work till one of these rocks begins to give water. The agriculturists are too poor to bear the expense of deepening wells by their old method of blasting by gun powder and excavating by hand labour. The wells, therefore, are deepened here in famine times only, when the agriculturists are freer to do this work themselves or can hire labour at a nominal rate. Large sums are sometimes spent on digging wells with no results. If another well is dug in the line from which water is coming to an old well, the latter becomes dry at once. These are the difficulties in extending irrigation from wells and improvement may possibly be effected by the above method.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(f) I very strongly recommend a thorough study of each cottage industry that was prevalent in different parts here. Owing to the peculiar situation of this district and frequent periods of famines, when crops are spoiled and the agriculturists are left with nothing to do, it is most necessary to find out what cottage industries are peculiar to each tract and such industries should be encouraged, with Government aid if necessary. Famine works which are started during famine periods are no remedy for the evil. We have to give the agriculturists a subsidiary industry which may give them subsistence in times of famine and some extra income during ordinary times by occupying their spare hours. I would not venture on any suggestion as the subject is very vast and technical. Different things might suit different areas and different

* Appendix V.

temperaments, keeping in view caste prejudices, *etcetera*. In times of famine on an average a man and woman get one-and-a-half to two annas a day after eight hours' hard manual labour. In certain cases the labourers have to walk a distance of four to six miles every day, early in the morning, with their children, *etcetera*, after grinding corn, cooking food and feeding the children. This means the women folk getting up before dawn and they cannot repose till eleven or twelve at night because, after reaching home they have to go through the same process of cooking, *etcetera*, again and also looking after the cattle if there are any left. Such hard manual labour and want of rest, coupled with insufficient nutrition, leave them lean and exhausted after each famine. Any industry, therefore, which can be universally adopted and can yield them one-and-a-half annas per head per day of eight hours sitting at home in better surroundings will be a godsend to them and is the greatest necessity for the economic emancipation of the agriculturists.*

QUESTION 22.—CO-OPERATION.—(a) (i) The Government should employ special staff for new kinds of societies in addition to the existing supervising staff, and should allow grants for training of staff in agriculture, dairy farming and cattle breeding. Special grants for propaganda by printing and distributing leaflets, holding lectures, classes and conferences, should be allowed annually. The Government should also undertake the responsibility of paying for the audit staff of primary societies for some time to come at least. They should adopt a liberal policy of helping by loans and grants all well-considered schemes for establishing mortgage banks, putting up godowns for seed storage in villages by societies and improving land and village sanitation by co-operative effort. A liberal policy should be adopted in giving *taccavi* loans to co-operative societies for proper purposes when applied for.

(ii) The real honest non-official workers in the field of co-operation should be encouraged by proper recognition of their selfless work by the Government.

(b) (i) The number of credit societies in this district is 458, of which 39 societies were registered during last year. We could form more societies but it would not be wise to organise societies without previously providing trained staff for their supervision. Their owned capital is 34 per cent of the entire working capital and the membership stands at 9,559. The panchayats of these societies have been exercising great caution in giving loans and have employed stringent methods in recovery from bad members. The societies advanced Rs. 2,12,552 to members during last year. Unproductive loans are steadily discouraged and the legitimate requirements of good members are met by the societies as far as the capacity of such members to repay permits. Members of good societies are becoming more and more efficient in controlling their affairs. The departmental efforts have so far been directed to concentrating full attention on the spread of methodical banking habits in this district. The poor agriculturists have accumulated about six lakhs of rupees out of nothing, simply by their persistent efforts towards self-help and mutual-help during the last twelve or thirteen years. Some of the societies set aside funds from their profits annually for useful objects, such as, buying and storing of articles required in the villages for marriages and other functions, building and deepening common village wells and for educational purposes. Though the beginning is small, it shows that the spirit of self-help has begun to generate in good societies. A few of the societies which have created sufficient funds for their needs have lowered the rate of interest on their loans to members. Our aim is to create sufficient funds in the villages for the ordinary requirements of the members, to be accumulated by their own efforts and to be given free of interest to members who deserve it by reason of their honesty, punctuality, hard work, self-control and thrifty habits.

* Para. 17 (f) (2), Appendix I.

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The mistakes committed and the defects noticed in the working of the credit societies in the past are enumerated in paragraph 12 of my pamphlet* "Agricultural Condition and Rural Economy in Ajmer-Merwara."

(iv) Two societies have been started for improvement of land, one of which in Nasirabad has strengthened a village tank and the other in Ajmer has given loans to members to sink wells on their *barani* lands. Small tanks the construction of which cannot profitably be taken up by the Government may be built by co-operative effort if cheap long-term money can be arranged and this will increase the produce of the agriculturists. All these different kinds of societies aim primarily at propaganda and at the organisation of public opinion in the direction of improvement; they teach the people that they can do collectively what they can seldom do individually.

(viii) A few cattle-breeding societies were started in Merwara about the close of last year. The necessary conditions for their success are:—

- (1) the whole village agreeing to castrate their useless bulls;
- (2) provision of a good suitable bull in the village to produce good milch and plough cattle;
- (3) arrangement for his up-keep and keeping him in proper health;
- (4) that the pasture which is used by cattle of these societies may not be encroached upon by cattle of other villages where useless bulls are not castrated.

(ix) We formed a better farming society during the year at Beawar. It has seventeen members. The idea is that they will cultivate at least one field each at each cropping according to the instruction of the agricultural expert, who is engaged here by the District Board, and will thus see on their own fields the difference in produce brought about by the use of labour-saving implements and improved seed and compare the result with what they got by cultivating by old methods. The local authorities are considering how best to tackle the question of the supply of improved seed to agriculturists in the absence of an agricultural department here. Lack of sufficient agricultural staff is a great hindrance to the success of such societies. The one agricultural graduate we have here has no time to visit the fields of our members in time, and hence no progress worth the name has yet been made in this direction.

(d) In Ajmer-Merwara we have only had, so far, experience of credit societies. Owing to past mistakes and want of technical knowledge of the subject by the persons who were entrusted with the inauguration of the movement, progress has been rather slow. On the whole, about ten per cent of the credit societies can safely be said to be good and to have achieved their object.

The illiteracy of the agricultural population and their old indebtedness are great hindrances to making the societies self-reliant and independent of outside help. The majority of the remaining societies are improving and within the next five years will be fairly on the road to progress if nature helps them by giving two or three consecutive good crops.

QUESTION 25.—WELFARE OF RURAL POPULATION.—(a) 1. This being a minor Province, there is no development department here to give expert advice on agriculture, irrigation, breeding of cattle, dairying and the like to the agriculturists. No communication, sanitation or economic boards are in existence here to hold enquiries on these important subjects for the benefit of the agriculturist and no real effort is made to ameliorate his condition in these directions. His methods of agriculture are primitive while the average standard of production and the general level of rural welfare is deplorably low.

2. Dispensaries are few and far between in the villages, as are the post offices. There are no veterinary dispensaries in the villages. More dispensaries in rural areas should be started in central places either by the Government or by the District Board. The Province has suffered heavy mortality

* Appendix I.

in the last influenza and plague epidemics. If the establishment of allopathic dispensaries be costly, I suggest that a service of indigenous *vaid*s and *hakims* should be started and one placed in every village. Rural people have great faith in their treatment and full advantage would be taken of their services.

3. I would recommend that rural community councils, on the model of the Punjab, with a certain number of ex-officio members and others nominated by Government and representatives of public institutions interested in the work, should be formed to do propaganda for rural welfare by magic lantern shows, starting village libraries and giving lectures. Attention should be given to sanitation and hygiene of villages, and lectures on temperance, child welfare, flies, malaria, plague, consumption, *etcetera*, should be given. The great difficulty in their establishment would be financial and I suggest that the Government should give grants for this beneficent work.

(b) I am in favour of inquiry into economic problems being held under the supervision of the Government. Government-paid trained investigators should be appointed to make scientific investigations into the economic conditions of the country people and to submit reports. The economic disease must be scientifically analysed before the cure can be prescribed. We can avoid many mistakes and pitfalls in our efforts to ameliorate the condition of the agriculturist if these enquiries are held beforehand by Government help.

APPENDIX I.

Agricultural Conditions and Rural Economy in Ajmer-Merwara.

Before discussing the subject matter of this note it is necessary that some introductory remarks should be made about the peculiar condition of the district and the natural disadvantages from which it suffers.

Ajmer-Merwara is an isolated Province of British India in Rajputana and is composed of two districts, Ajmer and Merwara. It is entirely surrounded by Indian States. The tract consists of hill and plain, Ajmer being comparatively open and Merwara mostly hilly. The district lies at a fairly high elevation (the city of Ajmer being about 1,600 feet above sea level) and it claims the distinction of including the water-shed of all plains in India.

2. *Villages.*—There are 746 villages in the district out of which 518 are *khalsa*. The total area of the district is about 2,711 square miles: nearly half of it is *khalsa* and *jagir* and the rest is composed of *istimrari* estates in which the *istimrardar* is the owner of the land and the cultivators his tenants-at-will. Generally the soil is poor and requires constant manuring to yield satisfactory crops.

3. *Holdings.*—The holding of cultivated and fallow land is 5 to 6 acres in Ajmer, 2·84 in Beawar and 1·6 in Todgarh, in most of the cases is scattered over a large area.

4. *Sources of Irrigation.*—In the absence of rivers, *jhils* or swamps the only sources of irrigation in this district are artificial tanks and wells. The former depend for their water supply on monsoons, and there being no permanent under-current of water, the latter too are fed by rainfall. Consequently scarcity of rain leads to a scarcity of water.

5. *Rainfall.*—The average rainfall of the district is about twenty inches, but lately it has been steadily decreasing. The Province forms the debatable land between the North-Eastern and South-Western monsoons and is therefore beyond the full influence of either.

6. *Population.*—According to the Census of 1921 the total population of the district is about five lakhs, out of which two-thirds comprises the rural population which mostly depends on agriculture. In bad years the agriculturists living near the towns make their living by plying carts, selling fuel,

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grass and *ghi*, while those who inhabit the purely rural areas find in the famine works the only industry that will give them a livelihood. In recent years they have taken to military service and working as mill hands, etc. The population of an average village in Merwara is about two hundred and fifty persons and in Ajmer about double the number.

7. *Agricultural Classes.*—The chief inhabitants of Merwara are the Mers, while the Jats, Gujars, Malis and Rajputs are other important agricultural classes. Jats and Malis are hard-working and good cultivators. Gujars are careless as agriculturists and devote their energy to keeping cattle. The number of agricultural cattle, sheep and goats has considerably increased during the past years, but the majority of them die in a famine year and co-operative insurance has not proved a success in any Provinces as a remedy for this mortality in the present condition of cattle.

8. *Literacy.*—Of the total population of five lakhs only about half a lakh are literate. The population of literates in the urban area is as high as four times that of the rural. Thus the percentage of literate persons in the villages is as low as six, but among the agricultural classes it does not come to more than one-half per cent.

The agricultural population of this district is described in different Settlement Reports as "docile, ignorant and debt ridden; their wants are few and debts very often many."

9. *Transport facilities.* There are 100 miles of railway and 187 miles of Imperial roads in the district and about 300 miles of District Board roads out of which only 33 miles are metalled. There are very few post offices and practically no telegraph offices in rural areas. Dispensaries too are few and far between.

10. *Seasons.*—In this district in a cycle of five or six years we get one good, two average, one or two scarcity and one famine year. What has already been said regarding the position and physical characteristics of this place is sufficient to explain why this Province is peculiarly exposed to recurring periods of scarcity and occasionally to the ravages of famine in its worst form. In the days of famine people in the afflicted tracts generally migrate to some favoured regions and return to their homes in time for the sowings of the succeeding year. Owing to paucity of pasture lands and scarcity of water supply the district is ill suited for cattle breeding on a large scale, though people seem to have a liking for it. Limited water supply is also a hindrance to fruit growing and gardening. References to the figures of the area cultivated and which failed from the year 1911-12 to 1923-24 show that, excluding the area of which the produce is below normal, on an average more than a quarter of the cultivated area totally fails.

11. *Development Department.*—I may mention here that, the Province being minor and non-regulated, there is no development department here to give expert advice on agriculture, irrigation, breeding of cattle, dairying, veterinary and the like to the agriculturists. No communication, sanitation or economic boards are in existence to hold enquiries on these important subjects for the benefit of the agriculturist. No real effort is made to ameliorate his condition. His methods of agricultural practice are primitive while the average standard of production and the general level of rural welfare is deplorably low.

12. *System of finance.*—The original system of financing the agriculturists in this district, as everywhere else, is through the individual moneylender who belongs to the professional moneylending classes. As a matter of fact the profession of moneylending in such a backward tract and among so docile a people as we get here is considered to be so lucrative that everybody, in whatever walk of life he may be, wants to invest his savings in lending money to the agriculturist classes, and once this side business is started he becomes a landlord in a surprisingly short time. This, perhaps, was one of the reasons for enacting the Land Alienation Regulation for this district in 1914. In Ajmer-Merwara the functions of professional moneylender and those of the village shopkeeper are generally combined in one. The villagers are mostly

heavily indebted and the amount of open debt is enormous. Of these money-lenders Mr. C. C. Watson, I.C.S., wrote in 1904 as follows in Ajmer-Merwara Gazetteer:—

“Years of famine gave an opportunity to the grain dealers to secure what would otherwise be bad debt. There is always a large amount of unsecured debt which has descended from father to son or consists of extortion of the grain dealers which they could not recover in civil courts. A hungry man is not over cautious as to what he puts his name to and the grain dealers find their opportunity in the necessity of the cultivators who, if they require food, are obliged to sign bonds or mortgage their lands for the full amount which the grain dealer states as due to them.”

In Ajmer it would seem that holdings are very small and crops are very precarious; there is practically no perennial irrigation. From Mr. Lupton's Final Settlement Report it will be clear that each cultivator has just one acre of land to cultivate (paragraph 56). He further writes in paragraph 57: “The villagers are heavily loaded with debts and there appears no hope of any permanent extrication from debt in the present conditions.” It is unnecessary to quote further from Mr. Lupton's Report (paragraphs 47, 57 and 58) or from Sir J. D. Latouche's Report (paragraphs 204 and 205). All this shows that the cultivating classes are either insolvent or on the verge of insolvency. Probably about ninety-five per cent of the Merwara agriculturists and eighty to eighty-five per cent in Ajmer are heavily involved in debt.

13. *Mortgage Debt.*—It is estimated that more than half the agricultural land has permanently passed into the hands of moneylenders and a very great portion of the land still with the agriculturists is mortgaged. In 1919 Mr. Calvert's enquiry into the question of the income of moneylenders showed that “their annual profits from moneylending come to about sixteen lakhs of rupees. What capital sum these profits represent it is difficult to estimate. If we put the profit at twelve-and-a-half per cent the capital must be about two crores. The census returns show a great increase in the number of moneylenders and they all seem to be thriving on the income of the agriculturists, leaving them impoverished. These alarming figures show that whatever is to be done should be done at once, and must be done thoroughly. The amount of debt, keeping everything in view, is in a vast majority of cases probably beyond the cultivator's power of repayment. To save the agriculturists from the tremendous drain of money in the way of interest on old debt the co-operative societies can play an important part and it is probable that ten or fifteen years' steady, persistent effort on right lines would result in saving the larger portion of this big drain on the people. If this saving could be effected, the whole economic position of the cultivators would obviously be vastly improved. Resort to the Insolvency Act is one of the ways out of the difficulty. The agriculturists are handicapped by a heavy load of debt which it is beyond their power to pay off. It is no use encouraging insolvent persons to struggle on; if the benefits of co-operation are to come to the people it is necessary that the question of old debt should be dealt with systematically.”

These facts show that the work which the co-operative movement had before it was by no means easy. In fact the whole position was deplorable. The Government tried methods to relieve the situation. The starting of the co-operative movement was one and the others are the enactment of various legal measures, viz.:—Talukdar's Relief Act, Ajmer Land Alienation Regulation of 1914 and Usurious Loans Act of 1918.

14. *Development of the Co-operative Movement.*—My sole object in referring to the past history of co-operation in Ajmer-Merwara is to show that the co-operative movement is full of possibilities and that mistakes, committed absolutely in good faith by one set of honest workers in one Province, may prove an eye-opener to others working in the same field in other Provinces. It is only by learning by our mistakes that we can hope to build a sound system

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of co-operation. In dealing with this movement it would be convenient to divide its activities into four distinct periods, viz.:—

- (a) 1905 to 1910.
 - (b) 1910 to 1913.
 - (c) 1913 to 1918.
 - (d) 1918 onwards.
- (a) The co-operative movement had a very humble start and the *istimrari* area was considered most congenial for the purpose. Difficulties of financing and managing societies with an unpaid agency in *khalsa* villages were felt and naturally *istimrari* estates, which were under the Court of Wards, became centres of activity. Soon after the passing of the Co-operative Societies Act of 1904, eight societies came into being, but there was no substantial progress up to 1910 in which year the first Central Bank of the district was founded. This naturally accelerated the progress.
- (b) From 1910 to 1913 the number of societies rose from 8 to 282, 3 central and 279 agricultural, with a membership of 8,611 and a working capital of over ten lakhs. The extension was astonishingly rapid but the foundations were not well laid. During this period the work was carried on entirely by an unpaid agency not well versed in co-operative principles and defects inevitable to such a system were prominently noted by Mr. Wilberforce (the expert deputed by the Government of India to advise and report on the movement). In 1913 for the first time a whole-time Government staff was sanctioned, consisting of one Registrar and one Inspector.
- (c) During the period 1913 to 1918 the co-operative movement was fostered by a paid staff and the number of societies rose to 362 agricultural and 4 central, with a working capital of about 27 lakhs of rupees, but unfortunately as before there was no propaganda work and little training in true co-operative principles was given to actual workers for want of enough trained expert staff. The two fatal mistakes committed during the period were:—
1. Wholesale liquidation of old debt irrespective of the condition of those who were resolved to be freed.
 2. Free advance of loans to agriculturists for maintenance purposes.
- The profits of the societies were also consumed to the extent of twenty-five, and in some cases thirty-seven and a half per cent by contribution towards the upkeep of the auditors and other ministerial staff of the office of the Registrar, with the result that the societies could not build up strong reserves.
- (d) 1918 onwards.—In 1918 the Government of Ajmer decided to take a trained official for the post of the Registrar, Co-operative Societies, on the retirement of Rai Sahib Munshi Gopi Nath. The newcomer, Mr. Jai Gopal, when he assumed charge of the post of Registrar, found the societies too unwieldy and not much imbued with the spirit of self-help and mutual-help. He naturally proceeded to split up old societies and weed out their undesirable members. The work of splitting the old societies was done rather hurriedly and by persons not fully qualified for the work. The number of societies at the end of last year stood at 456 agricultural, 47 non-agricultural and 8 central, with a total working capital of thirty-nine lakhs of rupees.

15. *Agricultural Societies.*—The working capital of agricultural societies was sixteen and a half lakhs and the owned capital (shares and reserve) a little over one-third of the whole amount, excluding the outstanding interest from the members.

Those who are interested in the guidance of the movement have mainly concentrated their efforts up to the present on the spread of methodical banking habits among the people of this district. The fact that over twenty-four lakhs of rupees are already in the movement all of which has been subscribed either by members of the societies or by active sympathisers, goes to show that the habit of saving has made progress. Out of the twenty-four lakhs, more than six lakhs is the actual saving of about ten thousand members of agricultural primary societies in the villages. This brilliant result in the short space of about twelve years among such an economically or educationally backward people is nothing but a miracle and is evidence of the inherent soundness of the movement. The movement was capable of still better results, but the efforts of workers were hampered to a great extent by constant bad years, heavy indebtedness of the peasantry, illiteracy of the people and apathy of the educated classes towards this movement. Here I may also mention that a reference to the administration report will show that since the inauguration of the movement and the passing of the Land Alienation Regulation the area of agricultural land transferred by sale and mortgage has decreased considerably. In the report of 1919-20 the Commissioner said "The area of agricultural land transferred showed a decrease owing to the working of co-operative societies."

The other notable effect of the movement on the agriculturists had been that the demand for *taccavi* loans from members of the societies was not quite so marked. I collected figures of loans advanced to members of co-operative societies from the year 1910-11 to 1924-25 under the heads improvement of land, purchase of land, and redemption of land, and found that about eight lakhs of rupees were advanced for these purposes. This evidently means that there was a considerable increase in the cultivators' assets during the period under review, in addition to their savings in the shape of shares and reserve (rupees six lakhs).

16. *Other activities.*—As I have already stated, the activities of the department were in the past directed mainly towards co-operative credit. The reason for this was that the question of the very high indebtedness of the agriculturists had to be tackled first. Besides, want of enough trained staff and absence of departments of agriculture, industry, irrigation, veterinary, dairying, breeding and the like to give expert opinions on the points pertaining to them, naturally stood in the way of taking up a wider field of activity. Recently we extended our activities towards co-operative storage of fodder and embankment societies for the purpose of irrigation. A few sheep breeding societies were also started but they failed for want of good rams which would thrive here and improve the breed of sheep. An Australian ram imported from the Hissar Veterinary Farm could not stand the local climate and died soon after its arrival, and the local sheep could not bear him either. We are tackling the question of the supply of necessities of the agriculturists, and marketing of their produce through a co-operative union, but the experience gained is too short to give a definite opinion.

17. *Conclusion.*—In my opinion if the Co-operative Department is to show any substantial results here the following are essentials—

- (a) The question of the old debt of the peasants should be tackled systematically.
- (b) Some comprehensive scheme to get over the difficulty of getting water for agricultural purposes should be explored.
- (c) A liberal policy should be adopted to provide sufficient Government staff for different kinds of societies in which the workers may specialise as time proceeds. Government should also finance all the new schemes with cheap money if it cannot be arranged profitably from the Central Banks.
- (d) The Province should be attached to some major Province as far as the development departments are concerned, so that expert advice may be available to the co-operative societies when required.
- (e) More rigorous steps should be taken to eliminate illiteracy among the agriculturists by providing education suitable to their re-

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quirements and circumstances. The suitability of the existing educational methods and curricula as applied to the needs of the rural population should be investigated.

- (f) Lastly (1) Government should adopt a definite policy with regard to propaganda. The Government should not be perturbed by slowness of results as any efforts to speed up the pace of the movement means disaster when the persons with whom the department is to deal are so backward economically, educationally, and morally. For instance, at the time of the retrenchment fever of 1922 it was seriously considered whether we should abandon the movement and wind up the affairs of the banks in the interests of economy. The department only survived because it was considered that to do so would constitute a breach of faith with the public who had invested large sums in the banks. On the other hand, experienced and high officials like the Hon'ble Sir R. E. Holland, the late Chief Commissioner, Ajmer-Merwara, attached considerable importance to the usefulness of this department. Thus there seems to be a lack of unanimity in the faith of the powers that be in the usefulness of the movement and the time has come when a public body like the Agricultural Commission should testify in no vague terms to the great possibilities of the co-operative movement and thereby give impetus to the movement.

(2) It may also be useful to encourage, in some form, any cottage industry that may suit the agriculturists of Ajmer-Merwara. It is a great pity that the rural population here should depend for their subsistence entirely on agriculture, and, failing that, on ill paid famine work. The money now spent on famine relief might perhaps be better utilised in starting cottage industries which would form a permanent source of income to the ryot and go a long way to improve his economic condition. The Co-operative Department could easily assist in the disposal of the produce.

(3) It also strikes me that if it is held that the co-operative movement bears a very important relation to agriculture, the Commission might suggest that it would be useful for the future rulers of States to have some training and acquaintance with this important subject in the Chiefs' College here before they go to their States and take up the reins of administration. This would popularise the movement in the States of Rajputana which have not yet seriously taken up the question of co-operation.

APPENDIX II.

Rules for the working of the Janch Committee.

Cases have come to the notice of the Commissioner in which the courts had passed decrees in money suits omitting to consider the nature of the transaction between the parties, that is whether the sums claimed were fairly made up and whether the interest amounts charged were reasonable. There were also cases in which instalments had been fixed without regard to the financial position as a whole of the litigant concerned. The Commissioner has accordingly made the following rules for the guidance of the Civil Courts in Ajmer-Merwara.

1. Whenever a case comes before courts to which the Usurious Loans Act (Act X of 1918) applies and in cases of a like nature when but for the qualifying words of Section 2, clause (3), that Act would apply, that is to say, in all cases in which the Courts have reason to believe that the interest is excessive and that the transaction was as between the parties substantially unfair, it may if it thinks fit refer the case under Order 26, Rule II, of the Civil Procedure Code to Committees formed under these rules which are to be called "Janch" Committees.

2. If the court thinks that the case is one in which instalments should be fixed, the question of the amount of instalments and the period over which they should be spread may also be referred to a "Janch" Committee along with the question of accounts.

3. Whenever the court decides to refer a case to a Janch Committee, it will select two persons out of the Panch or list of persons approved by the Commissioner for the jurisdiction concerned.

4. If one of the parties to the suit is a member of a co-operative society, one of the members of the above committees should always be a Sir Panch of the society of the village or circle from which the case comes.

5. In any other case, i.e., in cases in which the co-operative societies are not concerned, it would be desirable that one member of the committee should be of a community other than that to which the plaintiff belongs.

6. It will be discretionary with the court to appoint a third person on the committee in case the two existing members cannot agree to a joint report, but this should be done rarely.

7. The courts may accept, modify or set aside the report submitted by the committees above stated in the exercise of powers vested in them by law, but they should so act as to make the committees as far as possible a success.

8. In fixing an instalment the courts would be well advised if they have regard to the liabilities of the litigant as a whole, and if such litigant is a member of a co-operative society the Registrar of Co-operative Societies may be invited to give the necessary help in the matter.

9. Every six months a statement should be submitted by each Court to the Commissioner, in the form annexed to these rules.

10. If the courts think necessary a separate register may be maintained for the purposes of the above statement.

Form of statement mentioned in Rule 9.

1	2	3	4	5	6	7
Period	Number of money suits disposed of during the period.	Number of such suits in which the aid of the committees was invoked.	Number of such suits in which members of co-operative societies were parties.	Total of the amount claimed during the period.	Total of the amount in respect of which suits were dismissed.	Total of the amount decreed during the period.

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APPENDIX III.

REGULATION No. II of 1911.

A Regulation to provide for the grant of loans to indebted Talukdars in Ajmer.

(RECEIVED THE ASSENT OF THE GOVERNOR GENERAL ON THE 25TH MAY 1911; AND PUBLISHED IN THE GAZETTE OF INDIA ON THE 27TH IDEM).

Whereas it is expedient to provide for the grant of loans to indebted talukdars in Ajmer; It is hereby enacted as follows:—

1. *Title, extent and commencement.*—(1) This Regulation may be called the Ajmer Talukdars Loan Regulation, 1911.

(2) It extends to the territories for the time being administered by the Chief Commissioner of Ajmer.

2. *Definition.*—In this Regulation, unless there is anything repugnant in the subject or context, "talukdar" includes istimrardar, jagirdar, and bhumia.

3. *Application for loan.*—Any talukdar may apply in writing to the Commissioner stating that he is subject to, or that his immoveable property is charged with, debts or liabilities other than debts due or liabilities incurred to Government, and requesting that he may be granted a loan in accordance with the provisions of this Regulation.

4. *Contents of application.*—The application shall contain a declaration that the applicant has made himself acquainted with the provisions of this Regulation and agrees to abide by them and by the rules made thereunder, and such other particulars as the Chief Commissioner may by rule prescribe, and shall be verified by the applicant in manner required by law for the verification of plaints.

5. *Procedure on application.*—The Commissioner, on receipt of an application under section 3, shall forward the same to the Chief Commissioner. The Chief Commissioner may—

(a) summarily reject such an application, or

(b) direct that the Commissioner proceed to take further action under this Regulation.

6. *Notice to submit claims.*—(1) The Commissioner, on receipt of an order from the Chief Commissioner under section 5, clause (b), shall cause to be published in the *Gazette of India*, and in such other manner as the Chief Commissioner may by general or special order direct, a notice in English and also in the vernacular, declaring that the applicant has applied for a loan under this Regulation, reciting the provisions of this section and sections 7, 8, 16, 17 and 18, and calling upon all persons having claims against the applicant or his immoveable property to submit a statement of the same in writing within six months from the date of the publication of the notice aforesaid.

(2) Every claim against the applicant or his immoveable property (other than a claim on the part of the Government) not submitted to the Commissioner in compliance with the provisions of sub-section (1) shall, save in the cases provided for by sections 6 and 13 of the Indian Limitation Act, 1908,* be deemed for all purposes and on all occasions to have been duly discharged, unless in any suit or proceeding instituted by the claimant or by any person claiming under him in respect of any such claim, it is proved to the satisfaction of the Court that he was unable to comply with the notice published under sub-section (1).

(3) Every claim admitted by the Court under the provisions of sub-section (2) shall, notwithstanding any law, contract, decree or award to the contrary,

* IX of 1908.

cease to carry interest after the expiry of six months from the date of the publication of the notice under sub-section (1).

7. *Effect of publication of notice to submit claims.*—With effect from the date of the publication of a notice under section 6, sub-section (1), the following consequences shall ensue, namely:—

- (a) the applicant shall be incompetent to transfer or create any charge on, or interest in, his property or any part thereof, or to enter into a contract which may involve him in any pecuniary liability; and
- (b) all suits and proceedings in any Civil Court in respect of any claim against the applicant shall be stayed, and no fresh suit or proceeding shall be instituted in respect of any such claim in any Civil Court.

8. *Saving of certain debts.*—Nothing in section 7, clause (a), shall—

- (a) apply to debts due or liabilities incurred to the Government,
- (b) apply to debts or liabilities which are incurred for necessities for the maintenance of the applicant or his family, or for the due observance of funeral and other ceremonies to the extent approved by the Commissioner, or
- (c) affect the capacity of the applicant to enter into a contract of marriage:

Provided that he shall not incur in connection with such contract of marriage any pecuniary liability except such as the Commissioner, having regard to the personal law to which he is subject, and his rank and circumstances, may in writing declare to be reasonable.

9. *Particulars of claim to be furnished.*—Every claimant submitting his claim in compliance with the provisions of section 6, shall furnish, together with his written statement of claim, full particulars thereof, and shall produce all documents on which he relies to support his claim.

10. *Statement of claims and assets.*—When the period for the submission of statements of claims under section 6 has expired, the Commissioner shall prepare—

- (a) a schedule of such claims, and
- (b) a statement showing the assets of the applicant, exclusive of the property mentioned in the proviso to section 60 of the Code of Civil Procedure, 1908.*

11. *Composition of claims.*—The Commissioner may make to any claimant a proposal in writing for the reduction of his claims; and if such proposal, or any modification thereof, is accepted by the claimant, and his acceptance is recorded or attested by the Commissioner, such acceptance shall, in the event of a loan being granted under this Regulation, be conclusively binding upon the claimant.

12. *Report by Commissioner.*—When the Commissioner has completed the consideration of all claims submitted to him, he shall submit to the Chief Commissioner the schedule and statement referred to in Section 10, and a report setting out in detail the claims against the applicant which he considers should be met from any loan sanctioned under this Regulation, together with a statement of any composition which has been agreed to by the claimants or by any of them.

13. *Final disposal of the application.*—(1) The Chief Commissioner, on receipt of a report under Section 12, shall either—

- (a) pass an order rejecting the application, or
- (b) grant a loan to the applicant on such conditions regarding repayment and rate of interest as he may prescribe.

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(2) If an order is passed under sub-section (1) granting a loan, such order shall specify the liabilities to be discharged by means of the loan.

14. *Effect of stay of proceedings.*—When an order has been passed under section 13 rejecting an application or when an application is withdrawn under section 19 before orders are passed under section 13, the following consequences shall ensue, namely:—

- (a) all rights and remedies shall revive to any claimants who have accepted a proposal for the reduction of their claims under the provisions of section 11 as if such agreement had not been entered into; and
- (b) in computing the period of limitation applicable to any suit or other proceeding for the recovery of claims due from the applicant, the period from the date of the publication of the notice under section 6, sub-section (1), to the date of the order rejecting the application, shall be excluded.

15. *Procedure on grant of loan.*—(1) When a loan is granted under section 13, the Commissioner shall forthwith discharge therefrom the liabilities specified under section 13, sub-section (2), and shall notify the date of such discharge in the *Gazette of India*.

(2) All the rights and remedies of claimants in respect of claims duly submitted under section 6, sub-section (1), which are not discharged by the Commissioner under sub-section (1), shall revive as if no action had been taken under this Regulation; and in computing the period of limitation applicable to any suit or other proceeding for the recovery of such claims the period from the date of publication of the notice under section 6, sub-section (1), to the date of publication of the notification under sub-section (1), shall be excluded.

16. *No suit to be brought on subsequent promise.*—(1) No suit shall be brought in any Civil Court against any talukdar upon any promise made after he has repaid a loan under this Regulation, to pay any debt contracted during the period between the grant and the repayment of such loan, or upon any ratification made after such loan has been repaid of any promise or contract made during such period, whether there is or is not any new consideration for such promise or ratification.

(2) Nothing in sub-section (1) shall apply to the debts or liabilities specified in section 8.

17. *Procedure on breach of conditions or of section 7 (a).*—(1) If any talukdar to whom a loan has been granted under this Regulation—

- (a) infringes any condition imposed under section 13, sub-section (1), clause (b), or
- (b) attempts to do any act which, under section 7, clause (a), he is incompetent to do.

the Chief Commissioner may by order in writing declare such talukdar to be disqualified from managing his own property, and such talukdar shall be deemed to be a landholder who is disqualified to manage his own property within the meaning of the Ajmer Government Wards Regulation, 1888,* and the Court of Wards shall thereupon assume the superintendence of the property of such talukdar.

(2) The Court of Wards shall withdraw its superintendence from any property of which it has assumed superintendence under sub-section (1) as soon as all loans granted to such talukdar under the provisions of this Regulation have been repaid to Government with the interest thereon.

18. *Termination of disability.*—In each of the following cases, namely:—

- (a) when a loan made under section 13 has been repaid to Government with the interest thereon, or

* I of 1883.

- (b) when the amount so lent with interest has been recovered by the management of the property under section 17, or
- (c) when an order rejecting an application has been passed under section 13,

the Commissioner shall notify, in the *Gazette of India* and in such other manner as the Chief Commissioner may, by special or general order, direct, that the talukdar has ceased to be subject to the disabilities mentioned in section 7, with effect from the date of the publication of such notification.

19. *Death of applicant.*—If an applicant, with regard to whom a notice has been published under section 8, dies before a notification under section 18 has been published—

- (a) the proceedings under this Regulation shall be continued as nearly as possible in all respects as if he were still living,
- (b) any person succeeding to the whole or any portion of his rights in land shall become subject in respect of those rights to the disabilities imposed by section 7, and shall continue so subject as if he had been the applicant.

20. *Power to make rules.*—(1) The Chief Commissioner, subject to the control of the Governor General in Council, may make rules for the purpose of carrying into effect the provisions of this Regulation.

(2) All rules made under this Regulation shall be published in the *Gazette of India*, and on such publication shall have effect as if they were enacted in this Regulation.

21. *Protection of public servants.*—No suit, prosecution or other proceeding shall be entertained in any Court against any public servant for anything done by him in pursuance or execution of this Regulation or done in good faith and in intended execution of this Regulation.

APPENDIX IV.

Copy of paragraph No. 6 from letter No. 982-S., dated the 15th February 1921, from the Registrar, Co-operative Societies, Punjab, Lahore, to the Hon'ble the Chief Commissioner, Ajmer-Merwara.

My impression is that the cultivators are keen on the movement, but are handicapped by a load of debt which it is beyond their power to pay off. Many must be insolvent, and it is no use encouraging them to struggle on. The legislature has provided an avenue of escape in the insolvency laws; but no one desires to see a general resort to this remedy, as there would be the danger of a moral decline. The best means of dealing with this problem would be the appointment of a commission, consisting of an Insolvency Judge, a representative of the creditor class and an official with revenue experience to watch over the interests of the cultivators. This commission would take up cases on tour and apply the remedy that appeared suitable. In short, I would recommend controlled insolvency, lest uncontrolled resort to the courts should lead to serious trouble. This is the most important matter.

APPENDIX V.

Copy of Rule No. 9 of Regulation II from Land and Revenue of 1877.

Partition of other lands.—Any person recorded as a sharer in land, not being common land of a village, may apply for a partition of such land in the manner hereinafter prescribed: Provided that the area of land in each share, after such partition shall not be less than ten bighas of well-land, fifteen bighas of talabi or abi land, or thirty bighas of unirrigated land or a proportion of such classes of land equivalent to ten bighas of well-land.

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Oral Evidence.

A.3552. *The Chairman:* Mr. Bal Kishan, you were Registrar of Co-operative Societies in Ajmer-Merwara until a few months ago?—Yes.

A.3553. How long did you hold that post?—For seven years.

A.3554. When did you take up the post?—In February 1920.

A.3555. What experience did you have of co-operative matters?—Before joining there I was working in the Punjab as Inspector.

A.3556. Do co-operative problems in Ajmer-Merwara differ from those in the Punjab?—As compared with the Punjab, Ajmer-Merwara is heavily indebted.

A.3557. When you went to the district, were the primary societies sound?—A large majority of them were heavily indebted. I have already given the reasons in the small pamphlet which I have attached to my note. Ten per cent of the societies are sound.

A.3558. Is repayment punctually made?—Not in the case of the highly indebted members because the loans given to them were beyond their capacity to pay.

A.3559. What about the education of the members of the primary societies when you first took up co-operation?—It was badly neglected. They only thought that the co-operative societies were a means of obtaining cheap money and that repayments might be suspended or remitted.

A.3560. Did you take any steps to educate them?—Yes. That was my main work for the first few years. I educated my staff and they in turn did the work of educating the people.

A.3561. By the time you left had you succeeded in effecting an improvement?—Yes; I am quite satisfied with the improvement effected; there was a large improvement.

A.3562. You have a fairly large proportion of really good societies?—I should think so.

A.3563. In your note of evidence you give us a comprehensive picture of co-operation in the tract. Is it your view that, taking the tract as a whole, co-operation is making headway?—People like it and, when we have settled this question of the heavily indebted members, it will make headway with long strides. When I left the indebtedness had come down by twenty-four per cent.

A.3564. How about the directorship of your Central Bank? Are you satisfied with it?—Yes; we have got a fair representation of the societies' members on the Central Banks from among the cultivators themselves.

A.3565. Were you successful in reducing the rate of interest charged by moneylenders?—Where there are successful societies, the moneylenders have reduced the rates considerably.

A.3566. To men who can give the security, I take it?—Yes.

A.3567. Did you find that the liability to successive famines was a serious hindrance to the proper working and expansion of the co-operative movement?—The whole problem requires a very thorough study. The difficulty is, when a famine comes and the repaying capacity is lessened, whether the man can recoup the deficit in a bumper year.

A.3568. What rate of interest were your members of primary societies paying for short-term loans when you left?—Generally at the rate of twelve and-a-half per cent, but in the case of the good societies it was reduced to nine per cent.

A.3569. That was brought about by the society itself?—Yes, because they knew the use of controlled credit; they had their own capital and therefore they thought it advisable to reduce it.

A.3570. Did you encourage that tendency?—Yes.

A.3571. *Sir Thomas Middleton:* On page 66 of your note you say "The movement has already reached a stage when it does not require Government money to any great extent for short-term loans". I am not clear whether

you are there referring to the movement in Ajmer-Merwara or to the movement general throughout the country?—I was referring there to the movement in Ajmer-Merwara only, because the investing public has acquired the greatest confidence in our movement, and money comes into the Central Bank at a very cheap rate.

A.3572. How many years is it since the movement was started in Ajmer-Merwara?—A small beginning was made just after the passing of the Act in 1905, but no headway was made.

A.3573. How did the first primary societies get their money?—The officer in charge of Court of Wards was entrusted with this work and he started about a dozen societies with the assistance of his wards who lent the money to these societies. But after opening some societies (I think the number was about a dozen) he found the move hopeless. Then he stopped opening primary societies and tried to create Central Banks. After a time the Central Banks became so strong that the interest of the members of the primary societies was sacrificed for the purpose of investing in the Central Bank money.

A.3574. What is the relation of the Central Bank at the present time? Do the primary societies not go to the Central Bank for their funds?—Most of the societies do.

A.3575. On page 70 you refer to the expenses of these *Janch* committees; they are at present, I understand, working on a voluntary basis, but you suggest the payment of a small sum if voluntary workers cannot be secured. Would it not be reasonable to charge a small fee to the man who gets relief?—The question as to who will get the relief, whether the debtor or the creditor, will have to be decided.

A.3576. It is the debtor, surely, who gets the relief?—It might be that the amounts shown as due have not been correct. At any rate I do not think that the debtor will object to a small fee being levied as he will be the gainer in the long run.

A.3577. The difficulty is that if Government begins to pay small fees, as you suggest, where honorary workers are not forthcoming, there would be a risk of all voluntary work ceasing?—I would not mind a small fee being paid by Government for such work.

A.3578. On the same page, you refer to the very low percentage of women in Ajmer. Is that due to the prevalence of infanticide? Is it suspected that there may be infanticide?—I am afraid I cannot say, but the fact is that the percentage of women is very low as compared with the male population.

A.3579. *The Chairman*: Have you ever known of a case where a female child had been destroyed by its parents?—No.

A.3580. *Sir Thomas Middleton*: You make a suggestion to the effect that, if compulsory education were introduced, parents might be let off if they sent one or two boys to school. Do you not think that once a boy went to school he would be likely to leave the land?—That depends on what education you impart to him.

A.3581. I imagine his parents would expect him to make a living without coming back to the land?—Generally the question is raised that an agriculturist is so poor that every child is an asset to the family, and therefore it is absolutely an impossible proposition in Ajmer-Merwara to introduce compulsory education. I have merely thrown out the suggestion for what it is worth.

A.3582. Have you found, in your experience of Ajmer-Merwara, that the credit of the agriculturist has been narrowly or unduly restricted by the working of the Land Alienation Regulation Act?—It has not been restricted; and if it has, it is very much to his good.

A.3583. That is the orthodox co-operative view?—Yes, because the agriculturist has not got the sense to use his credit properly. If we could first teach him how to use his credit and then proceed to increase it, that would be to his benefit immensely. Past experience has shown that he does not use his credit properly.

Mr. Bal Kishan.

A.3584. You say, in answer to Question 22 (a) (ii): "The real honest non-official workers in the field of co-operation should be encouraged by proper recognition of their selfless work by the Government." Do honours not go pretty freely to co-operators? They do not go to agriculturists, but I understood that they did go to co-operators?—Not in Ajmer-Merwara at any rate.

A.3585. You set out, on page 73 of your note, the necessary conditions for the success of cattle breeding societies in Merwara. What I want to know is whether there are any societies which, in fact, carry out these principles?—We are educating them, and the process is very slow. I started a few societies and I have found that they take a very long time to grasp the essentials. But my experience is that when once they take to it they do not give it up; they stick to it.

A.3586. You say quite rightly that if pasture is granted to a society which improves its cattle, no other cattle should be allowed on that pasture. Have you ever known of a society being able to keep outsiders' cattle off?—No; the societies are still young and it is too early to say anything.

A.3587. *Mr. Calvert*: I gather from your note with reference to the popularity of the profession of moneylending, that moneylending pays?—Yes, it does pay.

A.3588. In the movement in Ajmer, do you think that your societies were paying too much out of their profits?—Some of them are paying thirty-seven-and-a-half per cent for audit.

A.3589. Does that serve to prevent them from building up big reserves?—Yes.

A.3590. And therefore it serves to keep up the rate of interest?—Yes.

A.3591. In what directions do you think that Government help could best be given?—I consider that payment to the auditors should be made by the Government, and this would then reduce the percentage charge on the profits of the societies.

A.3592. What functions would you allot to Government in the movement?—I have said in my note that they should provide an expert staff to teach the members.

A.3593. You mean education?—Yes.

A.3594. Is it a fact that the Indian Army has ceased to recruit soldiers from Ajmer-Merwara?—No.

A.3595. The Merwara Battalion was abandoned, was it not?—Yes.

A.3596. Is that likely to have any economic effect on the countryside?—Yes, I think so.

A.3597. In the concluding part of your separate note,* you deal with the general policy. Is it your opinion that, by steady and persistent effort along these lines, the general economic condition of the people could be improved?—I think so.

A.3598. How would you describe the character of the cultivator class in Ajmer-Merwara?—They are very good people, and they are eager to receive any advice that may be given to them.

A.3599. When you first went to Ajmer-Merwara what was the condition of the Central Bank?—The Central Bank was working with a different spirit; I might say that they were merely concerned to make big dividends for their shareholders by charging a very high rate of interest to the societies.

A.3600. What kind of dividend did they pay?—They were paying twelve per cent all the time.

A.3601. *Dr. Hyder*: You say in your note that the cultivator should be shown the results of agricultural research by means of charts and graphs; do you think your cultivators would understand charts and graphs?—Yes, very easily. It has been tried in Gurgaon where I am posted. In one or two district conferences in Ajmer-Merwara, I showed them charts showing

* Appendix I, page 74.

how their owned capital was going up and the outside liability was coming down, and they liked it.

A.3602. You do not mean to say that the cultivator understands abscissa and co-ordinates and things of that sort?—No.

A.3603. You say that agriculture has been aptly described as the "trade of the year to come." Do you not think that agriculture has an advantage over other industries in that results in agriculture can be obtained in one year, whereas the results in others may take several years?—Yes.

A.3604. You are now in the Punjab Provincial Civil Service?—Yes.

A.3605. *Professor Gangulee*: In answer to Question 25 (a), you recommend the formation of a rural community council on the model of the Punjab one, and you say that the greatest difficulty in its establishment is financial. Have you got men to organise such a council?—We will find them.

A.3606. Do you see signs of non-officials coming forward?—They take a lot of interest in our Central Bank meetings. Wherever we hold a big meeting they take a lot of intelligent interest in improving their lot.

A. 3607. Does any particular caste take more interest in the co-operative movement than others?—You mean, who join the co-operate movement?

A.3608. Yes?—All agriculturists are very keen, especially the Jats.

A.3609. Your best primary societies are run by Jats?—There are some good Jat societies, and some societies of other castes are also good.

A.3610. Could you tell us the borrowing rate and the lending rate of the Central Banks?—It varies with the different Central Banks. There are three, one at Ajmer, one at Beawar, and the third at Nasirabad. The Central Bank at Ajmer take deposits at four-and-a-half per cent and lend at nine per cent; they give a rebate of one per cent to societies which pay back regularly. In Beawar the rate on deposits for three years is seven per cent and they are also lending out at nine per cent.

A.3611. On the question of repayment, do you take the help of the revenue officers?—We tried to make recoveries through the Revenue Department in the case of three awards; it was a failure. I think they could recover, but they do not pay any heed to it. The ordinary agency of the civil courts is more satisfactory.

A.3612. That sort of thing does not demoralise the movement?—I am afraid it does.

A.3613. Have you any suggestion to make as regards the enforcement of repayment through any other channels?—No. Better selection of members of the panchayats will remove the difficulty.

A.3614. You have a panchayat?—The managing committees are called panchayats.

A.3615. You are in favour of compulsory free primary education and you say that you would make education compulsory with certain restrictions?—Yes. I have just explained that the hours should be suitable to the agricultural classes and the vacations also should suit their convenience; the school should be so situated that the small boys could easily get to the school; then, if it is necessary, we shall not insist on all the children of the family coming to the school; one child per family will do.

A.3616. You see some signs of improvement in the desire for co-operative education amongst the cultivators and especially among the Jats?—Yes. In a few places I have seen that they are anxious to start adult schools, and schools for juveniles.

A.3617. Who are the teachers in these schools?—We try to find men from the training schools. The Central Banks found it difficult to maintain them, and so I moved the Education Department to take them over, and they have taken over some of them; the others are dragging on and every year make requests to the Central Banks for funds.

A.3618. The Education Department has taken over some of your schools?—Yes.

Mr. Bal Kishan.

A.3619. *Mr. Kamat*: Is the general economic position of the ryot in Ajmer-Merwara, say, in respect of indebtedness, any way better than the position of ryots in the other Provinces that you know of?—I have read Mr. Anderson's report on Muzaffargarh and find that the state of the ryots there, in regard to indebtedness, was very bad.

A.3620. I do not want you to draw any comparison between Ajmer-Merwara and particular districts in the other Provinces. I want you to give a comparison between Ajmer-Merwara and other Provinces generally?—I cannot give any opinion about other Provinces. I have not been in other Provinces.

A.3621. You are conversant with the Punjab?—Yes.

A.3622. As compared with the Punjab what is the position in Ajmer-Merwara?—It varies very much from district to district in the Punjab. The central districts are better off than the other districts. Ajmer-Merwara compares favourably with the district of Gurgaon, in which I am at present working.

A.3623. You need not specify any district; I want to know the average of the Punjab as against the average of Ajmer-Merwara?—The economic condition of the agriculturists in Ajmer-Merwara might be lower than in the Punjab, keeping in view the canal areas and the central Punjab.

A.3624. I am asking this question, because Ajmer-Merwara is a compact area and there are special relief measures operating there for the benefit of the population: the Talukdars Relief Act, the Land Alienation Regulation, the Usurious Loans Act and the Co-operative Act; four distinct Acts are in force in one compact area during the last fifteen years. I want to know whether the cumulative effect of all these measures has been to place Ajmer-Merwara in a better position than the other Provinces?—Yes; I should say these measures have had a very good effect.

(The witness withdrew.)

Diwan Bahadur DIWAN JAMIAT RAI, C.I.E., Retired Extra Assistant Commissioner, Quetta.

Replies to the Questionnaire.

The tract of country known as Baluchistan is, for the purposes of administration, divided into:

- (i) British Baluchistan, which comprises the districts (or *tahsils*) of Chaman, Pishin, Shorarud, Harnai, Duki and Sibi;
- (ii) "Agency Territories" which consist of the Zhob district, Loralai district, excluding the Duki *tahsil*, Quetta, Bolan Pass, Kohlu, Nasirabad and the Chagai Agency. (The legal status of the last named has not been defined.)
- (iii) The Marri and Bugti tribal area, which is under the political control of the Political Agent and Deputy Commissioner, Sibi district, and
- (iv) The States of Kalat (including Mekran and Kharan) and Las Bela.

The Royal Commission on Agriculture is required by the terms of reference "to examine and report on the present conditions of agriculture and rural economy in British India and to make recommendations for the improvement of agriculture and the promotion of the welfare and prosperity of the rural population." I presume the term "British India" for the purposes of this enquiry includes the areas in Baluchistan mentioned in (i) and (ii) above, which are directly administered by the officers of Government and to which most of the Indian laws have been applied, but does not include items (iii) Tribal area and (iv) States.

I may also mention that my knowledge is limited to Baluchistan only, and the answers I am giving to some of the questions consequently apply only to Baluchistan conditions. It may also be mentioned that in the greater part of the country the revenue is levied in kind. Government taking a fixed share of the produce, and rents and wages of artisans and agricultural labourers are also generally paid in kind.

QUESTION 1.—RESEARCH.—(c) I think it is very necessary for the advancement of agriculture in Baluchistan that the soils of various kinds in different parts of the country should be scientifically examined and analysed, their suitability for growing specified crops and their productive capacity ascertained, and the results thus obtained widely published in simple Urdu. No such enquiry has, so far, been undertaken, but in some of the Settlement Reports the classes of soil recognised by the zamindars have been mentioned. For instance, the following description of soils is given in paragraph 66 of the Settlement Report (1915) of the Barkhan *tahsil* of the Loralai district:—

“Classification of soil.—No scientific analyses in various parts of the *tahsil* have been made, but a rough classification of soils in accordance with their intrinsic properties is recognised by the people.” The principal classes are given in the statement attached.*

QUESTION 2.—AGRICULTURAL EDUCATION.—There is no separate school in the Province solely devoted to agricultural education, but small patches of land have been allotted to some of the schools, where boys are required to work. The Barnes (Anglo-Vernacular) Middle School at Sibi seems to have taken the lead in this respect, where a trained teacher is employed and very good specimens of the several crops grown by the boys under his guidance and supervision were exhibited on the occasion of the annual prize distribution of the school in February 1926, and again in 1927.

The Government fruit farm in Quetta, which is in the charge of a trained official, has been doing very useful educative work and supplying plants, etcetera, to fruit growers in various parts of the Provinces. It would be very useful to start schools for purely agricultural education in some central places where land and water are available. Pishin for the Quetta-Pishin, Sibi and Chagai districts, and Loralai for the Loralai and Zhob districts will be ideal places for such schools. These schools should be in the charge of experts, more especially men who have special knowledge of fruit trees of various kinds, as fruit production is a progressive and profitable industry in that part of the country, which is known as KHURASAN or highlands. These experts should also possess veterinary knowledge, as a considerable percentage of the population depend for their livelihood on camels and flocks of sheep and goats.

The local tribesmen are still very backward in education and very few, if any, join the ordinary schools merely for education for its own sake. They attend the schools solely with the object of qualifying themselves for Government service in ministerial and executive positions, for which in a small Province there is very limited scope. The result is that the so-called education puts false notions of dignity into the heads of the boys and renders them unfit for their ancestral occupations, which are mainly agriculture and *maldari* (care of sheep and goats). The services cannot possibly absorb the boys who are turned out every year by the schools, and the number of unemployed and possibly discontented, must, with the advance of education, increase. When a boy after attending a school, more especially a primary school, for some years, fails to obtain Government employment and considers it derogatory to drive the plough or attend a flock of sheep or goats, he becomes a burden to the family. During his absence from home while at school, his place has to be taken in many cases by a hired substitute, which adds to the burden of the family. Hence tribesmen in distant parts of the country do not see advantages in this kind of education. But it is likely that, in time, they may take kindly to agricultural education. In the initial stage of these new schools it will, I think, be necessary to hold out some substantial inducement to boys of the agricultural classes to attend. I

* Vide Appendix.

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mean that the education will have to be free for some time to come, and stipends sufficient to cover all expenses will have to be given.

It would also be useful to prepare in as simple language as possible, in Urdu, a small handbook, divided into two parts devoted to agriculture and veterinary subjects. The first part of such a book might deal with the classification of soils, seasons of sowing and reaping the principal crops, selection of seed, and the common diseases, preventive measures and remedies; while the second part might deal with cattle, camels, sheep and goats, their common diseases and remedies. Such a book might be used as a compulsory subject of study in the primary schools in rural areas.

QUESTION 5.—FINANCE.—(b) *Taccavi* advances are granted in accordance with the provisions of (1) the Land Improvement Loans Act (XIX) of 1883, and (2) the Agriculturists Loans Act (XII) of 1884, and the rules made thereunder by the Local Government. The rate of interest, one anna in the rupee or six-and-a-quarter per cent per annum, fixed by the rules, is very low compared with what the people have to pay to other creditors, and in special cases advances are given free of interest. Further inducements may with advantage be held out to agriculturists to avail themselves more freely of *taccavi* loans, and with this object, I would offer the following suggestions for consideration:—

Firstly: In Section 6 (1) of the Land Improvement Loans Act (XIX) of 1883 it is provided that “every loan granted under this Act shall be made repayable by instalments (in the form of an annuity or otherwise) within such period from the date of the actual advance of the loan, or when the loan is advanced in instalments, from the date of the advance of the last instalment actually paid, as may from time to time be fixed by the rules made under the Act.”

In Rule 17 of the Rules made by the Local Government under the Act it is laid down that “within reasonable limits, the convenience of the borrower should be consulted as to the date from which repayment should begin, and such date should not precede the date when, by the exercise of ordinary care and diligence, the profits from the improvement may be expected to cover the payment of the instalment. This period of grace, however, should not, without the special sanction of the Local Government, exceed two-and-a-half years from the date of actual advance of the loan, or, when the loan is advanced in instalments, from the date of the actual advance of the last instalment.”

I would suggest that the repayment of the instalments should not begin until after two years from the date of the completion of the improvement for which the advance has been taken, such period to be extended by the Local Government, in special cases, to three or four years. Necessary modifications on these lines should be made in section 6 (1) of the Act.

Secondly: When waste land which is the property of Government is improved by means of perennial irrigation effected with the aid of (a) *taccavi* loan with interest, or (b) *taccavi* loan without interest or at a reduced rate of interest, or (c) without such aid, the proprietary rights in such land may be transferred to the person who makes the improvement, on payment of a nominal price, the rates for (a) and (b) being higher than those payable under (c).

Similarly, when Government waste land is brought under cultivation by flood irrigation—*sailaba*—the *lath bandi* rights may be given to the person who makes the improvement.

Thirdly: Section 11 of the Act provides that “when land is improved with the aid of a loan granted under this Act, the increase in value derived from the improvement shall not be taken into account in revising the assessment of land revenue on the land, provided as follows:—

- (1) When the improvement consists of the reclamation of waste land and of the irrigation of land assessed at unirrigated rates, the income may be so taken into account after the expiration of such period as may be fixed by rules to be framed by the Local Government.

- (2) Nothing in this section shall entitle any person to call in question any assessment of land revenue otherwise than as it might have been called if this Act had not been passed."

"In the rules made by the Local Government in 1909 under section 11 (1) of the Act, provision has been made for the temporary exemption of improvements from assessment to land revenue in cases when the improvement is made with the aid of a loan under the said Act and consists of the reclamation of waste land or of the irrigation of land assessed at *unirrigated rates:—

- (a) *Reclamation of waste land*.—When land is reclaimed from waste and is brought under irrigation by means, other than perennial irrigation, no revenue shall be assessed on it for a period of three years.
- (b) *Improvement by irrigation*.—When rain-crop or flood irrigated land has been brought under perennial irrigation, no additional revenue shall be assessed on it for a period of three years.
- (c) *Waste land brought under irrigation*.—When waste land is brought under perennial irrigation, no revenue shall be assessed on it for a period of five years.

In each of the above cases the period of exemption shall be reckoned from the beginning of the harvest first reaped after the improvement is affected:—

The Government of India in Revenue and Agriculture Department No. 6-193-A., dated the 24th May 1906, enunciated certain principles with reference to the assessment to revenue of improvements of land and to the reduction of assessment when improvements cease to be of use, and in pursuance of these principles the Local Government has issued the following rules (*vide* paragraph 161, Chapter XXIV of the Baluchistan Revenue Manual):—

I. (a) When land is brought under irrigation by a new *karez*, whether with or without the aid of a loan with interest granted under Act XIX of 1883, it shall be exempted from the payment of land revenue for a period of ten years, which period may, with the sanction of the Local Government, be extended, in special cases, to fifteen years.

(b) In cases where the cost of a *karez* is comparatively small the District Officer may, with the sanction of the Revenue Commissioner, reduce the period, but it shall not be less than four years in the case of *khushkaba* or *sailaba* land and less than five years in the case of waste land brought under *karez* irrigation.

II. When lands are newly brought under perennial irrigation from sources other than *karez*es, whether the improvement is effected with or without the aid of a loan with interest under Act XIX of 1883, they shall be exempted from the payment of revenue for a period of four years in the case of rain-crops or flood irrigated lands, and five years in the case of waste lands. These periods can be extended, for special reasons, by the District Officer to five and six years respectively and by the Revenue Commissioner to ten years.

III. When waste lands are reclaimed by permanent rain crop or flood irrigated lands or regular embanked fields, with or without the aid of a *taccavi* loan, such lands will be exempted from the payment of revenue for three years, which may, in the discretion of the District Officer, be extended to five years and by the Revenue Commissioner to seven years.

IV. When the improvement of the nature mentioned in the preceding rules has been effected by the aid of a loan, granted free of interest or at a reduced rate of interest, the period of exemption which would be admissible under the rules applying to the case shall be diminished by a term the estimated revenue realisation for which will approximately cover the amount of interest foregone by Government; provided that the limit of exemption shall not be reduced below the period provided as a minimum in the particular case by rules."

* I may here note that as a general rule the rate of revenue in kind in irrigated and unirrigated land in Baluchistan is the same.

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There are special rules (paragraph 162) for exemption of fruit gardens from payment of revenue.

It appears to me to be desirable to make a distinction between the improvements effected (i) with the aid of a *taccavi* loan with interest, (ii) with the aid of a *taccavi* loan without interest or at a reduced rate of interest, and (iii) without any such aid, the period of exemption for classes (i) and (iii) being higher than that for class (ii).

Fourthly: Baluchistan is a dry country and sources of permanent irrigation are very limited. It is a significant fact that most of the so-called rivers depicted on maps have no permanent water. The principal local source of irrigation in the greater part of the country is the *karez*, an underground water channel, which is expensive to construct and maintain, and more often than not proves a failure. A considerable amount of cultivation depends on rainfall, which is scanty and precarious. For the *sailaba* (flood irrigated) cultivation, water is raised to the fields by means of embankments thrown across the beds of the hill torrents, which have to be renewed periodically at a considerable expense of labour and time. The pure *khushkaba* or rain crop cultivation is a gamble, there are hardly more than two average crops in about five years, and in some years the seed and the labour are lost. Small hill torrents emerge from ranges of hills carrying rain water, but the water is generally lost in the skirts of the hills. It would, I think, be advantageous to encourage the zamindars to build tanks or *bunds*, collect the rain water of these torrents and use it for irrigation purposes. For such works, *taccavi* advances may be given free of interest on somewhat the following conditions:—

- (1) That on receipt of an application a revenue officer, not below the rank of a *Naib Tahsildar*, should make enquiry from some of the leading local men of the vicinity and satisfy himself that the project is likely to be successful. In important cases the opinion of the irrigation officer should also be obtained.
- (2) When an advance has been made on sufficient security, a revenue official should see that the money is actually spent on the work for which it was taken.
- (3) If the project proves successful, the Government might take (to cover principal and interest) an enhanced share of the produce as land revenue (say one-thirtieth of the produce); i.e., when the ordinary rate of revenue is one-sixth of the produce, Government will take one-sixth plus one-thirtieth—six-thirtieths or one-fifth.
- (4) Should the project fail, Government might write off the advance given.
- (5) If it is, at any stage, found that the whole or part of the advance has been misapplied the advance with interest at six-and-a-quarter per cent should be recovered in a lump sum.

A separate annual grant may be made for such advances, which may be allotted to applicants individually or jointly in small sums, but sufficient to cover the cost of the project.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(a) (i) In Baluchistan the main causes of agricultural indebtedness seem to be—

- (1) The expenses in connection with securing a bride, the payment of which is an almost generally important factor in matrimonial relations. In olden days the price which had to be paid for a bride was comparatively small and was made, when girls were not exchanged for marriage, by a plot of land, camels, cattle or sheep, or among some tribes, fruit-bearing wild trees; and personal service to be rendered by the would-be bridegroom to the parents or guardians of the bride for a specified number of years. Cash was in those days rare and cash payments were consequently rarely demanded or made. The system of exchange of girls still prevails when the parties belong to the same section or are closely related, but cash payment has largely replaced almost all the other methods of payment, and along with the general rise of prices of all commodities the bride price has also risen enormously,

as also the amount of blood money. The remedy seems to lie in the hands of the tribesmen themselves, but they do not see any reason why the parents of girls should not realise what they can get for their marriageable girls. I remember a case when a *mullah* had half a dozen girls to give away in marriage and the guardians of one of the would-be sons-in-law asked the *mullah* to name a reasonable sum for a girl, putting forward as a ground that in the good old days a girl of the best class could be secured for about one hundred rupees. Thereupon the *mullah* said: "You are right, but in those days a fowl was not worth more than two annas, a sheep or goat about two rupees and a cow about ten or fifteen rupees. You can now get one rupee for a fowl, eight to ten rupees for a sheep or goat and forty to sixty rupees for a cow; am I not entitled to ask a proportionately higher price for a girl whom I have fed and clothed for fifteen years?" There was no further discussion and the man agreed to pay twelve hundred rupees. A more intelligent man in the course of discussion on this point said "We do realise that the bride price (*walwar*)—as it is called among the Pathans—has risen enormously, but you must remember that the money which thus changes hands remains in the country, while a large portion of the salaries drawn by outsiders and the profits made by the alien contractors and business men go out of the country." The expenses connected with other domestic ceremonies have also risen considerably.

(2) The general rise in the mode of living noticeable in the better class of buildings, clothes, ornaments and food, more especially among those who live in villages in the vicinity of bazaars and civil towns and come frequently in contact with the somewhat advanced alien population which consists mainly of Government officials and business men.

(3) In times of scarcity, the purchase of cattle, food and other necessities of life, on credit, often at a high rate of interest.

(ii) The sources of credit are:

(1) Government *taccavi* for improvement of land and purchase of cattle and seed grain.

(2) Purchase on credit of the necessities of life from the shopkeepers, and occasional cash loans. In the principal bazaars the shopkeepers are almost all aliens, the majority being Hindus and Sikhs, but in villages the local tribesmen are gradually supplanting the alien *baniyas*. The alien *baniyas* charge high rates of interest, especially on cash loans, while for supplies given on credit higher prices are demanded. The tribal shopkeepers hesitate on religious grounds to demand direct interest, but they adopt ingenious methods to realise the interest in indirect forms.

(3) Some of the well-to-do among local tribesmen make advances of grain and cash to their needy compatriots, but consider it contrary to the tenets of Islam to demand direct interest. In fact *sud khor* (taker of interest) is a term of abuse among them. But some of the clever among them adopt ingenious methods to realise what can be given no other name but interest. In such transactions a certain percentage, varying from ten to twenty-five per cent, is added to the quantity advanced, and payment is taken at the time of the harvest either in kind or in cash, whichever seems to be more profitable to the creditor. Thus A advances twenty *maunds* of wheat to B at the time when wheat is selling at four rupees a *maund*. B agrees to give back twenty-five *maunds*. At the time of the harvest if wheat be selling at five rupees a *maund* A will take wheat, but if the price of wheat comes down to three rupees, eight annas a *maund* A will take cash calculated at four rupees a *maund*, the price at the time when the transaction was made.

(4) To owners of sheep and goats advances are made by those who deal in wool, the price of the wool being fixed at the time and the wool taken in due season. Here too the *baniyas* make considerable profits out of the owners.

(iii) The reasons preventing repayment are mainly (1) failure of crops, and heavy mortality among cattle, sheep and goats; (2) heavy expenses connected with births, marriages, deaths, sickness, etc.

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his share of the movable and immovable property to which the *shariat* or custom entitles him. This must naturally lead to fragmentation of holdings, which in Baluchistan are generally of a small size. The custom, however, provides a safeguard, and that is that among the majority of the tribes females, though entitled to a specific share of the property by the Islamic law (*shariat*), do not inherit. In fact, the widows and unmarried girls form part of the assets, and the price realised on their marriage goes to the male members of the family. It would not do, I think, to interfere with the local custom, but it might serve as some check if rules were framed to the effect that all transfers of land, whether by partition, sale, mortgage, gift or exchange, should be registered in the revenue records, and a fee, calculated at a certain percentage on the value of the land, charged for such registration and for copying where copies of the entries thus made are required by the parties concerned.

QUESTION 10.—FERTILISERS.—(f) In the vicinity of Quetta the sewage water is used, and the rubbish and nightsoil is deposited in pits in charge of the municipality, whence it is sold as manure to the zamindars. In villages cowdung is used both as manure and as fuel, and in some localities sheep and goats are stabled on the agricultural land, the dung being used as manure.

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QUESTION 14.—IMPLEMENTS.—The following description of the implements in use, given in the Quetta-Pishin District Gazetteer (published in 1907) still seems to hold good:—

"The principal implements include the plough, which is known as *zivi*, the plank harrow or scraper (*ken* or *khol*) with which embankments are made, and the clod crusher, or log used in place of a roller for breaking clods and smoothing the ground, known as *mala*. Among minor implements may be mentioned the *rambai* or weeding spud, the *kodal* or mattock, the *dal* or wooden spade worked by two men with a rope for making small embankments, the sickle (*lor*) for reaping, the four or two pronged fork (*char shakha* and *doa shakha*) and the *trapae* or wooden winnowing spade, the rake (*para*) for collecting the grain and straw scattered on the thrashing floor and the *skanna* or chisel for grafting. There has been no appreciable improvement in these implements; rakes, axes, hand saws and knives of English manufacture are now sometimes used and the use of iron for agricultural work is probably more general than in former days. Lieutenant-Colonel Gaisford, while Political Agent, from 1889 to 1893, tried to introduce a better kind of plough, drawn by mules or horses, which he imported from the Roorkee workshops, but the people did not take to it."

It may be mentioned that among most of the agricultural communities of the Province the system of payment to village menials and artisans (known as *kamin*) in kind prevails and the parties consider it suitable. The blacksmith *cum* carpenter, who makes agricultural implements, receives a certain specified quantity of grain at the time the seed is sown and again at the time of harvest. In some cases a plot of common land and a share of water are allotted to the artisans. The zamindar supplies wood and iron for the plough, and the artisans provides the labour. In some places the artisan also supplies, free of cost, a razor or a knife once a year to the family. Hence people have not to go outside to purchase such implements as are absolutely necessary in the primitive state of the society. But it might serve as an inducement to others if light ploughs of a cheaper kind could

as also the amount of blood money. The remedy seems to lie in the hands of the tribesmen themselves, but they do not see any reason why the parents of girls should not realise what they can get for their marriageable girls. I remember a case when a *mullah* had half a dozen girls to give away in marriage and the guardians of one of the would-be sons-in-law asked the *mullah* to name a reasonable sum for a girl, putting forward as a ground that in the good old days a girl of the best class could be secured for about one hundred rupees. Thereupon the *mullah* said: "You are right, but in those days a fowl was not worth more than two annas, a sheep or goat about two rupees and a cow about ten or fifteen rupees. You can now get one rupee for a fowl, eight to ten rupees for a sheep or goat and forty to sixty rupees for a cow; am I not entitled to ask a proportionately higher price for a girl whom I have fed and clothed for fifteen years?" There was no further discussion and the man agreed to pay twelve hundred rupees. A more intelligent man in the course of discussion on this point said "We do realise that the bride price (*walhar*)—as it is called among the Pathans—has risen enormously, but you must remember that the money which thus changes hands remains in the country, while a large portion of the salaries drawn by outsiders and the profits made by the alien contractors and business men go out of the country." The expenses connected with other domestic ceremonies have also risen considerably.

(2) The general rise in the mode of living noticeable in the better class of buildings, clothes, ornaments and food, more especially among those who live in villages in the vicinity of bazaars and civil towns and come frequently in contact with the somewhat advanced alien population which consists mainly of Government officials and business men.

(3) In times of scarcity, the purchase of cattle, food and other necessities of life, on credit, often at a high rate of interest.

(ii) The sources of credit are:

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- be imported and used in Government gardens at some of the *tahsil* headquarters, and their practical utility thus demonstrated to the people of the country. The ploughs should be such as could be worked by oxen, ponies, and camels, as in some localities camels and even donkeys are yoked to the plough.

QUESTION 25.—WELFARE OF RURAL POPULATION.—Under this head I would offer the following suggestions for consideration:—

(a) The villagers in the greater part of the Province are still in a backward condition, though since the British occupation an all-round gradual improvement is noticeable, more especially among the people who live in the vicinity of the bazaars and come more frequently in contact with the alien population. The people have hardly any idea of hygiene and the village streets and surroundings are generally in a very insanitary condition, rubbish, cowdung and refuse of all sorts being thrown wherever there is an open space. The sources of water supply in the *khushkaba* and *sailaba* tracts are usually impure; at these places rain or flood water is stored in ponds, clothes and animals are washed, and water for domestic use obtained. In person, too, the people are not over clean. It would help to improve matters if (1) a travelling dispensary were established in every district, and (2) special trained sanitary sub-inspectors were appointed under the Medical Department. The sanitary course in Lahore lasts for about six months at present. Suitable local men who have passed the Matriculation examination might be given scholarships from the provincial revenues or the district local funds and sent to be trained on condition that after completing the course, such qualified individuals should be bound to serve for at least three years.

(b) and (c) In January 1924, the Government of India appointed the Indian Economic Enquiry Committee, which submitted its Report in 1925, and which came to the conclusion that "there is a widespread desire in the country for an economic enquiry", and made certain recommendations which have been summarised in Chapter X of the Report. In some Provinces boards of economic enquiry have been organised, which are of a semi-official nature and have been doing useful work. There is such a board in the Punjab, which has made enquiries on various matters connected with the welfare of the population and published certain treatises and reports. The questionnaire proposed by this Board for "Economic Enquiries in Rural Areas" covers a vast field; it is divided into sixteen chapters, to which are added three appendices, two of which are devoted to mortgages and the third to goats. It would, I think, be useful to conduct an economic survey in selected villages by a special agency. For this purpose it will be as well to have a central organisation at the headquarters of the Government of India, which should lay down the general principles, in the shape of a syllabus or questionnaire and general instructions, leaving it to the discretion of the Local Governments to modify the questionnaire and the instructions to suit local conditions. At the Provincial headquarters of the Local Governments a board might be convened and entrusted with the work of carrying out the enquiries and collecting the results, which results might be submitted for scrutiny to the central or headquarters organisation before they are published.

In 1918 when enquiring into the revenue rates in certain selected villages in the Province, I also made enquiries into the economic condition of those villages, but the time at my disposal was short and the field very extensive, so that the results obtained were not very elaborate or very satisfactory. The conclusions arrived at have been summarised in Appendix III to the Census Report (Census of India, 1921, Vol. IV) of Baluchistan.

QUESTION 26.—STATISTICS.—(a) (i) and (ii) Under the revenue rules in force in the Province crop inspections are made by the subordinate revenue staff for each harvest, but the results are not published and it is doubtful whether the publication of such results would be of any practical use to the people of the country. Crop experiments are also conducted, the area selected for such experiments being one-fortieth of an acre. I think it would be more useful if such experiments were confined to the principal crops, and in irrigated areas the produce of each recognised unit of water were ascertained.

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For instance, where the water of the *karez* is divided into *shabanas* (twenty-four hours' supply) the produce of the area irrigated with a *shabanaro* of water might be ascertained. Similarly where (as in Nari in the Sibi district) the water is divided into *pao*, *dahana* and *rahki*, the area irrigated by a *rahki* or *dahana* should be experimented upon. Such results, which would be readily understood by the people, would be more useful both to the people and the administration.

(iii) It was decided by the Government of India in 1919 that in order as far as possible to meet the wishes of the International Institute of Agriculture and to secure uniformity in regard to the time of year at which the census should be held, a census of cattle should be taken throughout British India at the end of 1919 or beginning of 1920 and repeated at intervals of five years thereafter. But considering the special circumstances of the Province of Baluchistan the Government of India approved that a systematic enumeration of livestock should be carried out at the time of the next census of the population. This was accordingly done and the results obtained in 1920-21 have been embodied in subsidiary table XLII (page 121) of the Census Report of 1921. These operations will, it is presumed, be repeated at each decennial census and no special action seems to be necessary so far as this Province is concerned.

(iv) and (v) In the greater part of the Province the land revenue administration is carried on on the old tribal lines, the revenue being taken in kind as a fixed share of the produce and no further action in respect of obtaining information or publicity seems to be necessary.

APPENDIX.

Classification of Soils.

Serial No.	Class of land.	Description.	Localities where it generally occurs.	Crops for which generally suited.
1	Matli	White and greyish in colour, sweet in taste, soft, absorbs water soon and retains moisture for a long time.	Chuhar Kot, Ishani, Baghao and Rarkan.	Wheat, <i>juar</i> , mung and all other crops sown in the <i>tahsil</i> .
2	Lakhi or Lakhri.	Reddish in colour, sweet to taste, soft, absorbs water soon and retains moisture for a long time.	In all circles of the <i>tahsil</i> .	Do.
3	Baggi	Whitish in colour, sweet to taste, soft, absorbs water soon and retains moisture for a long time.	Ditto	Do.
4	Rej or Rez	Darkish in colour, sweet to taste, soft, absorbs water soon and retains moisture for a long time.	Baghao and Rarkan.	Do.
5	Bhuri	Whitish grey in colour, sweet to taste, soft, absorbs water soon and retains moisture for a long time.	Lachari, Barkhan, Baghao, Rarkan and Rakhni.	Do.
6	Nial Chhari or Nil Chhar.	Whitish in colour, having an admixture of sand, sweet to taste, soft, absorbs water soon and retains moisture for eight or ten days.	In all circles of the <i>tahsil</i> .	Wheat, <i>juar</i> and mung.
7	Kali	Black in colour, sweet to taste and soft, absorbs water and retains moisture for a long time.	Baghao and Rarkan.	Wheat, <i>juar</i> , mung and all other crops sown in the <i>tahsil</i> .

APPENDIX—contd.
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Serial No.	Class of land.	Description.	Localities where it generally occurs.	Crops for which generally suited.
8	Watkar or Roheli.	Hard stony soil, colour resembling the colour of stones, which are found in it, absorbs water and retains moisture for a long time.	In all circles of the tahsil.	Wheat, <i>juar</i> and <i>mung</i> .
9	Kalijhari.	Darkish in colour, sweet to taste, soft, slow in absorbing water, retains moisture for a long time.	Rarkan.	<i>Juar</i> .
10	Kathi.	Yellowish in colour, sweet to taste, soft, absorbs water soon, but does not retain moisture for a long time.	Paghao.	Do.
11	Kalwali.	Black in colour, sweet to taste, soft, absorbs water soon and retains moisture for a long time.	Do.	Do.
12	Darmani (which has <i>drab</i> or inferior kind of grass in it).	Darkish in colour, sour to taste, soft, absorbs water soon and retains moisture for a long time.	Rarkan.	Inferior. Not suited for any crop. Wheat and <i>juar</i> are only grown when no other and better land is available but outturn is not good.
13	Nili Khai.	Hard soil of a darkish colour, sour in taste, slow in absorbing water and does not retain moisture for a long time.	In all circles of the tahsil.	Do.

Each of these classes of soil has not been recorded in the field registers (*khasras*), but when collecting information for the note books, the *Naib Tahsildars* obtained from the zamindars a rough estimate of the proportion of each class of land in the *mahal* (estate) and this proportion has been recorded in the note books.

Oral Evidence.

A.3625. *The Chairman:* Diwan Bahadur Diwan Jamiat Rai, you are retired Extra-Assistant Commissioner, Quetta?—Yes.

A.3626. Are you familiar with numerous tracts in Baluchistan?—Yes; I know most of the territory which is directly administered by Government.

A.3627. I take it, it is your view that, in the main, agricultural progress in the territory must depend upon the extension of irrigation?—Yes.

A.3628. At the same time, you no doubt recognise that the administration is a deficit administration so far as the Government of India's finances are concerned?—It is.

A.3629. You know that the annual revenue from Baluchistan last year was £110,000, while over and above that the Government of India spent £476,000 upon the administration of the tract?—Yes.

A.3630. Having regard to those facts, do you think the Government of India ought to embark upon extensive and expensive measures of irrigation?—During the past, Government have done a lot to improve the condition of the people, but it seems to me that something more should be done. I understand that an expert has been deputed by the Government of India to

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examine the question of water supply, and on his report will probably depend the future action of Government.

A.3631. In answer to Question 1, you suggest that publications on the results of the researches should be published in Urdu. What proportion of the rural population, do you suppose, is able to read Urdu?—The percentage of people who can read Urdu is very small; but we have a number of *patwaris* in the Revenue Department and most of them are conversant with Urdu; the court language is also Urdu and in primary schools also Urdu is taught. Therefore, if we had Urdu pamphlets, they would reach the zamindars through the *patwaris* of the revenue establishment and the primary school teachers.

A.3632. Is there a literate man in each village?—Not in each village. We have *mullas* in almost every village, but their language is more Persian than Urdu.

A.3633. Is it your experience, talking of education in the tract with which you are familiar, that boys who go to school are willing to go back to agriculture?—They generally do not.

A.3634. And yet you suggest that agricultural schools might with advantage be multiplied?—As regards ordinary education, we have primary schools which teach up to the fifth class. After having gone through the primary school the boys are fit neither for Government service nor for anything else. If we had agricultural schools where agricultural education would be given, they might become more useful both to themselves and to the country.

A.3635. Are there any firm indications that the boys taught at the agricultural school would return to their farms, or would they go in for Government service?—They would probably go to their own farms.

A.3636. Do you think they would be willing to return to their farms?—Yes.

A.3637. Can you say that that view is founded upon any experience?—In Quetta and in some other places experimental farms have been attached to schools, and the boys who have been trained there go back to their own profession.

A.3638. In answer to Question 2, you give us an account of the school at Sibi, called the Barnes (Anglo-Vernacular) Middle School, where some attempt has been made to give experience of cultivation?—Yes.

A.3639. Do you know whether the result of that has been to turn the minds of the boys passing through that school to agriculture?—They are generally the local boys who are working on the farm attached to the school, and I think they will probably go back to agriculture.

A.3640. In answer to Question 14, you are anxious that some experiment should be conducted with a view to evolve a light plough. Have there been any experiments designed to produce an improved type of plough?—In the Quetta farm they have introduced it, but not in the villages.

A.3641. I suppose the attempt by the Political Agent in 1889 and 1893 to introduce a better kind of plough drawn by mules or horses suffered from the handicap that there were no mules or horses to pull them. Is the mule or horse common there?—No. We have bullocks and donkeys.

So, unless the Political Agent in his wisdom had produced not merely the ploughs but also the mules and horses, he was almost certain to meet with disappointment.

A.3642. Is there a great shortage of firewood in some tracts?—Yes. In fact, during the last few years most of the forests have been denuded of trees.

A.3643. It has been suggested to the Commission by another witness that something might be done in order to persuade the cultivators to plant up areas with trees, and it was suggested by that witness that if irrigation were extended, cultivators might be willing to set aside a part of the land irrigated for the growing of timber?—I doubt that very much. Of course, according to our present condition, when we give *faccari* advances for agriculture it is laid down that a certain number of trees should be planted along the

water channel, but beyond that I doubt very much if the people will give up culturable land for growing trees.

A.3644. When you give *taccari* loans for the extension of minor irrigation schemes, it is laid down that a certain number of trees should be planted along the water channel?—Yes.

A.3645. Is that rule obeyed?—It is generally carried out.

A.3646. What protection is given to these trees during their early stages of growth?—In fact, there is not much protection, but the revenue officials go about the country and see that these conditions are fulfilled.

A.3647. How old would these trees be before they are cut down?—It depends on the various classes of trees. The pistachio tree is supposed to last about five hundred years.

A.3648. That would involve rather a long sighted policy. Are cultivators forbidden to cut down these trees before a certain period of time has elapsed?—Yes. They have to get permission.

A.3649. That varies according to the class of tree planted?—Yes.

A.3650. Has that provision supplied, to any substantial extent, the demand for wood and firewood in the tracts to which it has been applied?—I do not think so.

A.3651. It has not made a sufficiently large contribution to make any difference?—No.

A.3652. *Professor Gangulee*: Do you think there is a great deal of scope for the extension of fruit cultivation in Baluchistan?—There is, but it all depends on irrigation.

A.3653. That is the handicap?—Yes. I had some figures the other day, which showed that, as it is, the area under garden during the last twenty years had considerably increased, and that the ordinary irrigation land had decreased proportionately.

A.3654. But fruit gardens have increased?—Yes.

A.3655. What sort of fruits are they growing?—Principally grapes, peaches, apricots and apples.

A.3656. These are exported from Quetta?—They are exported from Baluchistan and not only from Quetta itself. A good deal is exported from all over the country.

A.3657. Is the Barnes Middle School at Sibi based on the Punjab model?—We follow the Punjab curriculum in all our schools.

A.3658. How long has this school been going?—So far as I remember, it was established in 1881, but the agricultural class has been started during the last three or four years.

A.3659. Do you know of any student coming out of this school who has taken to farming or fruit growing?—I could not tell you exactly, but I think the tendency of the pupils is to go back to agriculture; it is yet too soon to expect results.

A.3660. On page 95 of your note, you mention that amongst most of the agricultural communities of the Province the system of payment in kind to village menials and artisans prevails. Are the rents and wages in your part of the country paid in kind?—Yes.

A.3661. What is the basis of calculation?—There are various methods. In some places the land-holders give a portion of land and water to the artisans and they do certain services. In other parts of the country a certain percentage of the produce of the land is given to them. There are various methods.

A.3662. We understand that many soldiers have gone back and settled in Baluchistan. Is that a fact?—Taking the indigenous population, there are very few people in the Army. It is mostly the Hazaras who originally came from Afghanistan that have settled in Baluchistan after retiring from the Army.

A.3663. Do you find that the fact that they have settled in Baluchistan has affected the economic conditions of the country in any way?—I doubt

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very much. Compared with the total indigenous population of the country their proportion is very small: insignificant in fact.

A.3664. What about their economic outlook? Is it better than that of the Baluchis?—To some extent it is, because they have various concessions. In some cases they have been given land, and almost all of them get their pensions.

A.3665. *Sir Thomas Middleton*: You give us an interesting classification of soils. How do you come by this classification? Is it generally recognised in Baluchistan?—Not throughout Baluchistan. I was Settlement Officer of the tract, and I obtained this information locally; it only concerns one particular tract, namely, Barkhan *tahsil* of Loralai district.

A.3666. I think I know how you ascertain the soils that are sour to the taste, but how do you discover those soils that are sweet to the taste?—It is the people's practical knowledge. That is what they told me.

A.3667. When they say that the soil is sweet, do they not mean that it is not sour. Is there such a thing as sweet soil?—The local people call it "*mitthi*", which means sweet.

A.3668. Just as you use the term for water?—Yes.

A.3669. They ascertain the sourness in the soil by the tongue?—Yes.

A.3670. *Mr. Calvert*: In your tract, revenue is taken in kind?—Yes, the greater part of it, and the general rate is one-sixth of the produce.

A.3671. Could you tell us whether, by converting it to cash at the ordinary current rates, the revenue would be higher than if it were taken on a cash basis?—It would be much higher.

A.3672. *Dr. Hyder*: You know Baluchistan intimately? You have spent all your service there?—Yes; I have been there for forty-six years.

A.3673. Take all the ordinary departments that you may find, say, in Ajmer-Merwara. They have a co-operative organisation there. Have you got one in Baluchistan?—No.

A.3674. The wealth of Baluchistan consists of sheep and goats?—Yes.

A.3675. Is there anybody to advise the local sheep owners as regards the diseases and ailments of sheep?—We have a Veterinary Department. There is a Deputy Superintendent in charge, and in various places veterinary dispensaries have been opened.

A.3676. Has any work been done on the improvement of the fleece?—I do not think so.

A.3677. Do you think it would be good for the country, as a whole, that work of that kind should be done in Baluchistan?—I think it would be very useful. In fact, in my note I have made a suggestion that we ought to provide, in the *taccari* advances, *taccari* loans for breeders of sheep and goats, so as to encourage the breeding of those animals.

A.3678. You must have served under many Political Officers. Does your Political Officer perform the kind of work that is done by a Collector in India, or does he perform, over and above the duties of a Collector, work which is of a diplomatic kind?—His work mostly consists of diplomatic and tribal cases. The proportion of revenue work which he has to do is small compared with his other work.

A.3679. So that, so far as the Province is concerned, if the pay and allowances of these higher officers were to be paid by the Central Government, and if the pay and allowances of the subordinate officers were met from the provincial revenues raised there, it would be equitable. Do you think that that would be a better arrangement? My point is this, than at present your Political Officers have to perform work which is of local importance and which is also of All-India importance, and the Province has to pay their salaries and allowances. You admit that the Province cannot pay its way?—Yes.

A.3680. The officers in Baluchistan are not there entirely for the benefit of Baluchistan but also for the rest of India?—Yes.

A.3681. Do you not think it is right and proper that, making these qualifications, you should split the cost in the proper proportions and debit it to

the proper sides?—Take for example the Political Agent. He has revenue and judicial work, which is mostly *jirga* work. Next to him are the Assistant Commissioner and the Extra Assistant Commissioners. They also exercise powers over *jirga* cases. *Tahsildars* are purely revenue officers but they also do a portion of the tribal work.

A.3682. Then it comes to this, that the whole of your administration in Baluchistan performs work which is really of All-India importance?—Yes.

A.3683. Has any work been done in the matter of horse breeding?—Yes; that has been the principal thing since 1882. We have a horse breeding department with veterinary officers in charge.

A.3684. You are aware of the findings of a committee on which action was taken in 1922. I refer to Lord Inchcape's Committee. I was wondering whether you, in Baluchistan, suffered in any way on account of the recommendations of that committee. Were any officers in your departments retrenched?—I do not think that the result has been prejudicial to Baluchistan on the whole.

A.3685. There are certain areas under the Government of India which are in the position of step-children. They have no revenues of their own and the Government of India do not do anything for them. Do you think it would be a good arrangement if all these areas combined together and pooled their resources. The advice of an officer in Ajmer-Merwara would, if such a plan were adopted, be available for example to Baluchistan and Coorg. Do you not think it advisable to do something on those lines?—At present the officers of the Political Department are on an Imperial cadre. They can be transferred from Persia to Bangalore. Taking the Provincial Service, our conditions are so peculiar that I do not think a man trained in Coorg would be any good in Baluchistan.

A.3686. Supposing there were one or two officers under the Government of India whose help would be available to all these various minor administrations, do you not think it would be useful?—I think it would be very useful if we had an officer for Baluchistan and the North-West Frontier Province.

A.3687. Take for instance the Co-operative Department. If you had a subordinate agency in Baluchistan under the control and guidance of officers who operate not only in one minor administration but in all the minor administrations, do you not think that that advice and control would be of benefit to the local people?—It would probably be very useful.

A.3688. *The Chairman*: Is fruit growing, as practised by Indians in Baluchistan, a whole time occupation?—Do you mean by the Baluchis, because Indians are treated as aliens in Baluchistan?

A.3689. Tell us about the Baluchis?—They generally combine it with agriculture.

A.3690. Is it your experience that a cultivator in Baluchistan can with advantage and profit look after a few trees, or is it necessary that he should have a substantial area planted as an orchard?—It is the bigger area that pays; the smaller orchards do not pay.

A.3691. Do the people who own the bigger orchards also have time to pursue agriculture?—They generally employ tenants and also trained gardeners.

(The witness withdrew.)

Diwan Bahadur Diwan Jamiat Rai.

Wednesday, October 26th, 1927.

KARACHI.

Present:

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

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

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

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

Raja Sri KRISHNA CHANDRA GAJA
PATI NARAYANA DEO of Parla-
kimedi.

Professor N. GANGULEE.

Dr. L. K. HYDER.

Mr. B. S. KAMAT.

The Hon'ble Sir CHUNILAL MEHTA.	} (<i>Co-opted Members.</i>)
Mr. JAMSHED N. R. MEHTA.	
Mr. J. A. MADAN, I.C.S.	} (<i>Joint Secretaries.</i>)
Mr. F. W. H. SMITH.	

Mr. J. W. N. CUMMING, Retired Extra Assistant Commissioner
in Baluchistan, Quetta.

Replies to the Questionnaire.

QUESTION 1.—RESEARCH.—(b) A laboratory with a staff qualified to undertake the chemical analysis of plants, soils (including rocks) and water should be established at Quetta, the headquarters of the Baluchistan local Government. A fee could be fixed for each analysis which would go towards cost of upkeep. (Such a laboratory would also be a boon to prospectors in search of minerals, ochres, etc., and fees so realised would probably tend to make the laboratory self-supporting, while a great impetus would be given to the industrial development of the country, which is sadly needed.) So far as Quetta itself goes the nature of the soil varies considerably, consisting in places of (i) clay with a fair admixture of sand; (ii) of a hard clay so impervious that it will hold up water for days and weeks on end and where wells if sunk need no brick lining; (iii) of an excellent potters' clay requiring wells to be lined with burnt bricks as otherwise the sides collapse with the oscillation of the water in the process of being brought to the surface by means of water lifts; (iv) of a hard clay heavily charged with soda salts; (v) of gravel and, very rarely, (vi) of sand.

Quetta can produce the finest of European fruit and vegetables in most places and yet, in parts, owing to the different nature of the soils and the deficiency of certain plant-foods therein, fruit trees are unhealthy and vegetables will not thrive. I have noticed a very great difference in the texture of the clay even within a small area. I have had a number of holes dug within 10 feet of each other and on flooding them the water has disappeared in some within 24 hours, in others within a few days, while in others the diminishing of the water has been so slow that it appeared to be due more to evaporation than to absorption or percolation. Coupled with this difference in the texture of the clay, the soil has been so heavily impregnated with

soda salt (principally sulphate of soda) that certain fruit trees will not thrive in it, while others appear to be indifferent to it. I have been successful in eradicating sulphate of soda from the soil by growing lucerne (alfalfa), but this is a long process covering a few years.

Another successful method has been to flood and then run off the water alternately and repeatedly but this, too, is a long process. (In other parts of Baluchistan the soda salts consist of sulphate of magnesia and carbonate of soda, which are more harmful to plant life.) Again I have in one place just outside Quetta (and there must be many such) found the surface soil suitable for cultivation; but, on sinking a surface well, found the water heavily impregnated with soda salts. On the other hand just the contrary is the case where I eventually established my orchard; the surface soil was heavily charged with soda salts to a depth of four or five feet only; but on sinking a well I found the water (which I had analysed) all that could be desired as regards quality.

Were a laboratory, with a qualified staff, established in Quetta, samples of the soil and water could be analysed before land (which is expensive) is purchased and agricultural operations started; while, in the case of sickly fruit trees and vegetable plants, both the plants and soil could be analysed and early action taken to supply deficiencies in the plant-food necessary.

Again, systematic research carried out by a qualified and experienced staff is very necessary in the matter of injury caused to fruit trees by insect pests.

The reason for the green-fly attacking only certain fruit trees and leaving others alone, though in very close proximity to them, was traced by Mr. Howard to the frequent flooding of buds in the winter.

But there are other pests, like flying beetles, which appear in large numbers in the spring and do considerably more harm by attacking and destroying the blossoms. There is no possible means of preventing these flying beetles from entering your orchard and settling on your fruit blossoms. How then can they be destroyed? As their larvæ develop underground, a careful fruit-grower might, by judicious cultivation, prevent them from breeding in his orchard; but he cannot prevent the mature insects which have developed elsewhere flying into his orchard and damaging all his fruit blossoms. Their destruction, therefore, calls for concerted action on the part of all fruit-growers, which can only be assured by pressure from Government, which however, cannot be expected to move without being made fully satisfied by a qualified Government staff that that is the only method that should be adopted.

Again, there are other pests like the cicada which appear periodically, about once in nine years, and settle for about three weeks or more at a time in myriads on all trees—fruit and timber alike—in certain localities only, where they live on the sap of the trees. These insects are the product of waste land. Their larvæ, like those of the beetle pests, develop underground and, while you might be able to destroy them within your own land by constant cultivation, there is nothing to prevent those breeding on waste land in your neighbourhood from swarming on to your trees and sucking them dry. What is the remedy? In my opinion, there is only one and that is for Government to insist on the owners of all waste-land ploughing up all such land regularly, at least once or twice every year, failing which Government should take it over and do what is necessary themselves. But such action on the part of Government cannot be expected except on the advice of a properly qualified staff of experts.

Lastly, research work is essential as to the best way of protecting fruit trees from late spring frosts. Do you know what it means to grow a fruit orchard after years of very great expense and labour, then watch your trees burst into life with myriads of lovely healthy blossoms all pregnant with promise of a successful crop, and then have all your hopes blasted in one night by a late spring frost? Do you know what it is to see this take place year after year? If so, you will realise that it is one of the first essentials in successful fruit-growing to find ways and means of combating those late

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spring frosts. But the means to be adopted are entirely beyond the resources of the fruit-growers. Government and Government alone—the *Ma Bap* of the agriculturist—is in a position to solve this problem. The only thing necessary is more water and more humidity in the climate and this can only be assured by the conservation of our wasted rainfall by means of terraces, bunds and dams in the direction of the prevailing cold dry winds and the regular and systematic planting at the same time in their neighbourhood of all classes of suitable forest growth.

QUESTION 3.—DEMONSTRATION AND PROPAGANDA.—(a) The establishment of a Government experimental farm in Quetta has been helpful in demonstrating:—

- (i) the classes of fruit trees that are likely to succeed in Quetta;
- (ii) the value of maintaining and the method of running fruit nurseries;
- (iii) the cause of fruit trees being attacked by the green-fly;
- (iv) the method of laying out and the value of cultivating the soil in fruit orchards;
- (v) the value of having trained men in charge of them;
- (vi) a better method of fruit packing than was practised before;
- (vii) improvements in transport for fruit sent by railway.

(b) Small agricultural shows should be held twice yearly in Quetta, in July and September, at which—

- (i) fruit, vegetables and flowers in season at the time should be exhibited by the Government experimental farm and private fruit and vegetable growers. One show at the end of the summer is not sufficient as the early varieties of fruit, vegetables and flowers cannot be exhibited;
- (ii) accessories for canning and bottling fruit (duly priced) and for drying fruit and vegetables should be on view and demonstrations made in the use of them;
- (iii) different types of ploughs and water-lifts (including windmills) should be exhibited and practical demonstrations given in working them;
- (iv) bulletins and charts on agriculture, fruit-growing, fruit canning and bottling, fruit and vegetable drying and storage should be exhibited for sale; a representative of the Agricultural Department should invariably attend these shows.

(c) The trained staff of the Government experimental farm should be increased with the object of one or two trained men being made available for visiting private orchards and fields periodically, by request or otherwise, where they could give expert advice and report needs of individuals concerned to the Agricultural Department, which should also be established for Baluchistan in order to initiate and enforce concerted action on the part of agriculturists where such is needed. Take for example the proper cultivation of the soil both in orchards and waste land. This is essentially necessary both for the good of the land itself, for the absorption of rain water which otherwise runs off the hard surface and causes destructive floods, for the destruction of numerous insect pests in the larval stage which develop in uncultivated soil and, when fully matured, fly to the nearest orchards and destroy blossoms, fruit and trees though carefully tended by their owners.

(d) The value of clover as fodder was duly demonstrated by the Government experimental farm but it did not catch on with the zamindars as it needs an ample and permanent water supply. This is sadly wanting in Baluchistan and will be duly referred to under "irrigation". The zamindars find lucerne (alfalfa) sown once in three or four years more paying and less troublesome to grow, whereas clover needs annual sowing.

QUESTION 4.—ADMINISTRATION.—(c) (i) While not intending in any way to undervalue the work being done in Baluchistan by the Veterinary Service, I consider agriculture should come first and should be directly supervised by

its own special department. There is much to be done in Baluchistan in the development of agriculture in all its branches.

Our Political Officers have too much other work to do to give agriculture that close attention and detailed supervision that it needs and their work will only increase, not decrease, if the first essential in the administration of a country, viz., agriculture and the provision of a permanent and ample supply of water, is not given careful consideration.

Immense tracts of country lie waste for want of water, the rainfall of the country runs off uncontrolled through numerous deep water channels scoured out by annually recurring floods and is absolutely wasted, while numerous mountain ranges in the neighbourhood offer scope (i) for the construction of every form of water-saving device from small terraces and *bunds* to the largest and most up-to-date types of dams required for large irrigation reservoirs and for the simultaneous establishment, in their neighbourhood, of immense forests which also hold up rain water, prevent floods and erosion of fertile land and by pressing water from the soil into the atmosphere, calculated by Mr. Zorn, the American Forest Expert, at between "2½ to 4 million pounds per acre" in the course of a year ensure the humidity of the atmosphere, the increase of rainy days so necessary for good agriculture and the lessening of heavy dust storms which prove so dangerous in travelling both by rail and air, apart from the very important fact that their increase will mean cheaper firewood for the cultivators, which in its turn would enable them to use the whole of their cowdung for improving the fertility of their land.

(ii) Railways might also assist agriculture by the carriage, at half scheduled rates or by other cheaper arrangements, of sand so essential in the aeration of soil especially in those tracts where hard clays predominate. There are places where desert sand is encroaching on the railway track. Instead of spending large sums annually on merely clearing it off the line with the certainty that it will be blown back, it could be carried away by trucks to the nearest agricultural centres, dumped down at the railway stations and the zamindars induced to carry it off for admixture with their hard clay soil. The periodical treating of clay soil with sand in place of manure will be found to be most beneficial for the growing of both wheat and fruit trees, not only because it will increase the aeration of the soil and prevent cracking and the rapid escape of moisture so essential to plant life in hot dry climates but also because of the iron which all desert sands contain which will improve the quality of the outturn.

(iii) We want more metalled roads connecting grand-trunk roads and towns with villages, over which carts can carry their grain and fruit to the towns and return with manure, etc.

QUESTION 5.—FINANCE.—The grant of *taccari* advances, at present, is essentially necessary and should be encouraged, care being taken that the money so granted is not diverted to other purposes such as marriages, etc. Long-term credits should be allowed, the instalments in repayment being fixed as small as possible. The very fact that, in spite of the admission that "agriculture is the foundation upon which the whole economic prosperity of India rests and upon which the structure of her social and political future must in the main be built," our agriculturists as a class are proverbially poor, entitles them to every possible consideration and I would urge that all such advances be given without interest. It is high time that their present condition of hand-to-mouth existence should be raised to one of assured comfort, if not of affluence. But it would be better if, at the same time, some form of employment could be found for agriculturists for slack times every year, when ploughing, sowing and watering have been done and the men have nothing to occupy their leisure hours. In this connection I would make the following suggestions, some or all of which might be adopted according to prevailing conditions:—

(1) Metalled roads might be constructed in the neighbourhood of the villages, on which the agriculturists might be employed in preference to outsiders.

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(2) Land, whether private or belonging to Government, ruined by erosion might be reclaimed and sown with forest trees. The agriculturists and their plough bulls could be employed in the construction of the necessary terraces and *bunds* under the supervision of trained Irrigation, Public Works, or Forest officers. Grazing on such land should be absolutely prohibited for a term of years till the trees have quite grown up and then two separate scales of grazing fees might be levied, viz:—

- (a) a low one in the case of private land, and
- (b) a higher one if the land belongs to Government.

(3) If there are hills in the neighbourhood of the villages, they could be similarly employed in the construction of terraces on the slopes and of *bunds* or dams in the gullies or valleys for the conservation of what I term our wasted rainfall, while, at the same time, forest plantations could be started in their neighbourhood, the same restrictions being enforced on grazing.

(4) No waste land, i.e., land not actually under crops, whether private or Government, beyond what is actually required for the grazing of village animals, should be allowed to stand unploughed. All landowners should be compelled to plough up their waste land at least twice a year, and where at the beginning they are too poor to do so, Government should advance them the money needed for the hire of plough bulls and insist on this being done, care being taken that the hire is not in excess of the rate prevailing in each locality. Government land should be similarly ploughed up, the cultivators from the nearest villages and their bulls being employed thereon and paid for by Government. All land thus treated will become more fertile. The rainfall will not run off but soak deeply into the soil and be retained much longer than otherwise. Erosion will be stayed and, lastly, insect-pests whose larvae breed in the soil and which now do so much damage, will be kept under control and fruit-growers in the neighbourhood, whose orchards though carefully tended now suffer from them, will have no cause of complaint in this direction.

Provided with some such employment for their idle moments, agriculturists will soon be able to repay their loans, purchase more plough-cattle, go in for better ploughs and the more up-to-date labour-saving machinery employed in civilised countries, and build better and more sanitary dwellings to live in. At the same time the increase in the number of cattle will provide more manure for the soil and the new forest growth will in due time provide cheap firewood, cheap timber for buildings and ploughs and increase and regulate the much-needed rainfall. Fruit culture which is now so unprofitable, if not ruinous, will become a success. And last, but not least, with their time fully employed the much complained of quarrels over water and women will diminish to a minimum and our political officers will have more time to give to other important work.

QUESTION 6.—AGRICULTURAL INDEBTEDNESS.—(a) (i) The main causes in Baluchistan are:—

- (1) The want of an assured and abundant water supply, the responsibility for providing which must rest with Government. Zamindars have, in the past, endeavoured to supply this want by constructing *karez*s (an underground system of obtaining irrigation water—see Question 8.—Irrigation). They have had to borrow large sums to this end and, after a brief period of prosperity, have found it a white elephant, the up-keep becoming ruinous. The system itself is an iniquitous one and should be absolutely discouraged. To provide a village and its fields with water you deprive land-owners higher up of all their sub-soil water with the result that all their trees—timber and fruit—gradually die off and the *karez* owners themselves get ruined in the end.
- (2) The want of subsidiary employment during slack times. In this connection see my suggestions under Question 17—Agricultural Industries.

- (3) **Marriages.** The custom of bride-price, the bridegroom or his father having to pay a high price for the bride, is another cause of indebtedness. Where women are largely in the minority, as is the case in Baluchistan, they have to be bought as wives. Every girl is a source of wealth to her family, the exact amount varying with her looks, her social position and her youth. But what is at the root of this objectionable practice? In the majority of cases it will doubtless be found that the father or uncle, as the case may be, is a bankrupt. And what is the cause of his bankrupt condition? In the majority of cases it will be traced to the failure of his water supply and who is to blame for this but the Government? It is not very pleasant reading to come across in an Administration Report, in this connection, some such remark as "The usual quarrels and bloodshed have taken place over those everlasting subjects of contention, women and water; but so long as the supply continues unable to meet the demand, such quarrels must continue."

How have we attempted to improve this sad state of affairs? By appointing one solitary irrigation officer of the very lowest grade and one forest officer of practically no standing, probably a forest ranger, for an area of 54,228 square miles, excluding the Indian States of Kalat and Las Bela the combined area of which is said to be another 80,410 square miles.

(ii) Generally moneylenders.

(iii) Want of an assured water supply, which results in failure of crops, sale of plough bulls, grain and land and general ruin to the zamindars.

(b) Government must tackle the water question seriously. They must make themselves responsible for an assured and abundant water supply. In this connection see under Question 8.—Irrigation. "The King himself is served by the field" Eccles. 5:9.

QUESTION 8.—IRRIGATION.—(a) I would strongly advocate the adoption of new irrigation schemes on a large and generous scale in the following districts in Baluchistan:—

(1) The Quetta-Peshin district, where the only irrigation works at present consist of—

- (i) a large *bund* at Khushdil Khan, near Peshin;
- (ii) another large *bund* at Nar Nullah near Hanna;
- (iii) three large tanks near the Saranan railway station.

While the area under reserve forests is 54 square miles.

(2) The Chagai district.

(3) The Loralai district which possesses 53 square miles of reserve forests.

(4) The Sibi district, which at present possesses only one irrigation work, viz., a fine canal of perennial water taking off from the Nari river, by means of a weir with drop-shutters which allow of the escape of all flood-water. Reserve forests in this district cover an area of 107 square miles. Two river systems serve the above named areas, viz.:—

- (i) The Shorarud and Peshin Lora, the total length of which is about 250 miles.
- (ii) The Nari river, which has a total length of about 190 miles before it debouches on to the Nushki plain.

As the Shorarud portion of the first system lies mostly in the Kalat State and the Nari river passes through the Marri-tribal area, both these territories will of necessity have to be associated with these schemes; but as they are under our political control and will be benefited by any improvements carried out, their permission and consent to share in the cost should not be difficult to obtain.

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The whole country through which these two rivers flow is mountainous, except at Nushki and Sibi, where the plains are entered. For their development I would suggest that the two schemes be treated as a circle and be given a full staff of irrigation and forest officers, whose first duty should be to carry out a detailed survey of the whole of each area with the object of—

- (i) selecting the most suitable sites for constructing terraces, *bunds* and dams and areas suitable for reserve forests; and
- (ii) estimating the cost of working out each scheme.

In connection with the Shorarud, Peshin Lora Scheme, I have published notes in 1920, 1925 and 1926, as the waste flood-water therein referred to eventually finds its way into the Peshin Lora. There is no need for me to add to the remarks therein made.

As regards the Nari scheme, I understand that a new project has been prepared by our irrigation officer for the construction of a large reservoir at Tanduri to hold up flood-water. It is hoped that this scheme will meet with the early approval of the Government of India.

In addition I would urge that, simultaneously with this undertaking, the survey of the whole Nari catchment area by both irrigation and forest experts be carried out. To give some idea of the volume of flood-water coming down the Nari, I quote the following from page 11 of the Sibi District Gazetteer:—

"The river having to carry off the drainage of the enormous catchment area of the Anambar and Narechi rivers, besides contributions from several mountain torrents, is between Chotiali and the Nari Gorge, subject to very sudden and high floods in the autumn, when it becomes a roaring torrent fifty feet deep as it rushes in places between precipitous banks."

For any country to receive such a volume of the precious liquid year after year (I understand the river is in flood on an average about 57* days in a year) and still remain poverty-stricken would be unthinkable in any other civilised country. Why then should it be allowed in territory under our control, more especially when we have scientific data to prove that its conservation and judicious distribution will improve our rainfall?

No further incentive, it seems to me, is necessary for the concentration of all our powers in holding up this flood-water and uplifting the country in which it is found. Simultaneously with the construction of terraces and *bunds* in the tributaries higher up the river, it seems to me that somewhere in this neighbourhood is the place where a suitable dam might profitably be built, the output of which would not only increase the permanent flow of the Nari river below it, but might also, without any loss to cultivation, be used for generating electric current sufficient for the supply of light and power to the greater part of Baluchistan, while the vapour arising from the great reservoir thus formed and from the forest trees and cultivation which should spring up all around it would materially increase the humidity of our very dry atmosphere.

Baluchistan is indeed a land of glorious possibilities: but it will remain so till the end of time, unless the Government of India awaken to the very important fact that loss of rainfall by way of floods means loss of capital, destruction of fertile soil and the ruin of its cultivators, bringing in its train loss of respect for their *Ma Bap* Government and, lastly, disloyalty.

As matters stand, what can our Agent to the Governor General do, provided as he is with a staff of only one irrigation officer and one forest officer—both of the very lowest grade—when the Province he has to administer covers an area of 54,228 square miles, excluding the Indian States of Kalat and Las Bela.

* May 5 days, June 5 days, July 21 days, August 20 days, September 6 days.

In this connection a reference is solicited to the comparative statement enclosed (see appendix) showing the administrative divisions of British India with their area and population. The position of Baluchistan in this comparison, after 50 years of British administration, is certainly not an enviable one and not creditable to our light and leading. The timely appearance in "Nature" under date the 8th January 1927, of an able editorial on *Forest Destruction and Its Effects* will, I hope, emphasise the value of forests in the economic development of a country, and the sooner we begin to awake from our lethargy in this direction the better for both India and Baluchistan.

There is one more point to which, in conclusion, I would invite attention here; that is the large tracts of gravel-beds which form such an outstanding feature of the country along the railway line between Sibi and Quetta. At present, flood-water flows down in deep channels which have been cut through these gravel-beds. I would suggest that these gravel areas be treated as filter beds, that in suitable places along each water course the existing water channels be filled and numerous *bunds* of gravel be built up right across the width of each river-bed, with the object merely of holding up as much flood-water as possible in the higher altitudes. As these gravel-beds become filled with water, they will become natural reservoirs in themselves for springs lower down the valleys. The very presence of so much gravel in Baluchistan is a proof that it once abounded with lakes, rivers and streams and our endeavour should be to restore, as far as possible, the original condition of things.

(a) (ii) The Quetta valley and many other parts of Baluchistan so abound in hard clays that the construction of tanks seems most suitable. I would suggest a series of these being made on both sides of some of the existing flood-channels which cross our valleys, into which the floods might be diverted as they come down the channels. The work of construction and subsequent control, as well as the disposal of the water and the leasing of any of the tanks themselves for cultivation after the water has been run out, might be entrusted to the Irrigation Department.

(iii) I am in favour of the construction of surface wells, artesian wells and strainer tube-wells in suitable localities but in the case of the two latter I think they should only be allowed where arrangements can be made to regularly replenish the artesian supply below ground by means of terraces and *bunds* at higher levels, i.e., at the foot, or on the slopes, of hills in the neighbourhood. The exhaustion of so many artesian wells in the Quetta valley strongly emphasises the necessity for this.

There never have been any obstacles that I know of to the construction of such wells in Baluchistan. Our Agent to the Governor General has always been ready to encourage enterprise in this direction, even to the extent of sinking some of them at Government expense: but in the case of strainer tube-wells the mistake has been made of entrusting such undertakings to inexperienced men instead of getting the most efficient and experienced engineers to supervise the work, at any rate for the first few years.

QUESTION 10.—FERTILISERS.—(a) I have no experience of the use of artificial fertilisers. The zamindars round Quetta use mostly cowdung and horse litter for such crops as wheat, barley and lucerne. For vegetable growing many take, on contract, the night-soil of the town. This is either carried by municipal carts direct to their land, emptied into previously prepared shallow trenches (8 feet by 16 feet by 1 foot) and then covered up immediately with the earth dug out of the trenches, where it is ploughed up with the soil three months later and planted with vegetables, or it is first deposited elsewhere in similar trenches and, after three months, the dry soil so treated is carried away in a pulverised condition and worked into the soil to be cultivated. I do not see why some arrangement should not be made in all large villages for the supply of public latrines and sweepers whose duty it would be to look after the cleansing of the latrines and dispose of the night-soil as above. Artificial manures should only be used after an agricultural chemist has been established in Quetta to whom samples of soils could be sent for analysis and report as to the particular fertiliser needed for any deficiencies of plant-food that he may detect in the soil.

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(f) Zamindars might be induced to plant a portion, say one-tenth, of their land with timber trees while measures should be adopted for general afforestation in the neighbourhood wherever feasible. These methods would speedily provide firewood, when all the cowdung of the village would be available for fertilising the soil.

QUESTION 17.—AGRICULTURAL INDUSTRIES.—(a) Cultivators who have a permanent source of water supply are generally busy throughout the year, growing wheat, barley, lucerne, potatoes, Indian corn and fruit. Whether the supply be large or small they have to make the most of it and so are fully employed. It is the unfortunate cultivators who own land dependant entirely on the rainfall (and these are in the great majority) that are without employment for at least seven or eight months in the year, and occasionally longer. During the slack season, one here and there may take to driving *tum-tums* (hackney carriages). The others, as opportunities offer, hire themselves out as day-labourers on ten or twelve annas per diem.

(b) A great deal of the indebtedness of cultivators would disappear if they could find regular employment during their slack seasons. The following is a list of works some of which Government might find it possible to start with the object of giving them an opportunity of supplementing the income they derive from their land and, at the same time, benefiting the country at large.

(i) *Brick-making, burnt and sun-dried*.—Where hard clay is available in the neighbourhood, a brick-kiln might be started and run by Government, the cultivators being taught and employed to make bricks of a standard size at a fixed rate per thousand. This would be cheaper for Government than buying such bricks in the open market. Cultivators are in the habit of making sun-dried bricks which are generally comparatively rough. Where large tanks would prove useful for the collection of flood water near the villages, they might have the sites marked out and be employed on them in brick making, either sun-dried or for the kiln. In this way, the tanks would be excavated and the sale of the bricks would cover the cost.

(ii) *Basket-making*.—If only Government would make itself responsible for the provision of a regular supply of irrigation water, willow trees of different varieties could be successfully grown in large numbers all over the high lands of Baluchistan and cultivators could be taught and profitably employed in this industry. Willows must have a constant supply of water. When I first came to Quetta, in December 1890, weeping-willows were plentiful all over the station, but, owing to the gradual lowering of the subsoil water, for which I blame the *karez* system principally, they have all disappeared, while other varieties of the willow are also dying out.

(iii) *Cattle-rearing*.—With an assured water supply all kinds of fodder could be cheaply produced, when alone cattle-breeding would become profitable in the highlands. At present, the high price of *bhusa* (wheat and barley straw) and the scarcity of grass make this industry impracticable.

(iv) *Carpentry*.—This would be a very profitable subsidiary industry for cultivators to take to in their slack season, but it will only become feasible when systematic forest planting is introduced and then only in the case of villages in the neighbourhood of forests.

(v) *Dairy farming*.—This too, like cattle-breeding, can only become profitable when an abundant water supply is made available and fodder becomes plentiful.

(vi) *Forest plantations*.—I would strongly urge that all cultivators should be induced to reserve a portion of their land—say about one-tenth—for the growth of such timber trees as the mulberry, which is indigenous to the country, the ash, the willows and the *robinia pseudacacia* which is suitable for standards for fencing. All these grow readily where irrigation water is assured. In six or ten years this would become a paying venture. Year after year, late spring frosts destroy our fruit blossoms and render fruit-growing in Quetta unprofitable and heart-breaking. Timber trees, on the other hand, would furnish fuel as trimmed each year, their fallen leaves in the autumn would help to improve the soil, while their sale eventually, when full grown, would more than cover all expenditure incurred on them.

Where mountain ranges exist in the vicinity of villages cultivators might usefully be employed by the Forest Department in their slack season in making bunds and terraces and laying out and working up forest growth. Apart from the direct benefit which such forest plantations would afford to the cultivators, there would always be the additional advantage that such growth, springing up all over the country, would increase the humidity of the atmosphere and produce an increased and more regular rainfall.

(vii) *Fruit-growing* should be a profitable subsidiary industry, but frequent late spring frosts caused by cold dry winds from the north destroy the blossoms and with them all hope of bumper crops. The only way to prevent these late spring frosts is to hold up flood water and encourage forest growth all over the country, more especially in the direction from which the damaging cold dry winds blow in spring. In passing over forest tracts and open expanses of water, cold winds, which have previously been deprived of their moisture, become enriched with a fresh supply. According to Mr. Zorn, an American forest expert, an acre of forest growth alone is calculated, in the course of a year, to pass into the air "from two-and-a-half to four million pounds of water." Recharged thus with moisture the north winds will do no harm to the blossoms. But who can undertake this work? Government, and Government alone, who are responsible for leaving no stone unturned in protecting the interests and providing for the welfare of their subjects, especially the agriculturists who form "the foundation upon which the whole economic prosperity of India rests and upon which the structure of her social and political future must in the main be built."

(In this connection I would note my personal experience in fruit-growing. I began by planting a large variety of fruit trees very much on the plan of an experimental farm; but this did not prove a commercial success. To make fruit orchards a real paying concern only one or two varieties of fruit trees should be planted in each orchard, the fruit of which will all ripen within one or two months of each other).

Fruit-shows, if held twice a year, say in July and September, might prove an incentive to this industry.

(viii) *Horse-breeding*.—The same remarks as against cattle-breeding apply.

(ix) *Irrigation bunds*, when needed near villages, should be constructed during the slack season and agriculturists and their plough-bulls should be employed thereon on daily wages.

(x) *Pottery*.—Excellent potters' clay is available in many parts of Baluchistan and pottery making, in all its branches, might be encouraged among agriculturists, wherever such clay is procurable. Before the War I succeeded in getting some of the cultivators to help me in making roofing-tiles, but they seemed reluctant to learn the use of the potter's wheel on which a Punjabi potter made my pots and drain-pipes. I see no reason why such reluctance should not be overcome.

(xi) *Poultry rearing* is a profitable industry and there is no reason why agriculturists should not take kindly to it. Doubtless, if poultry shows were held once a year at the same time as the second fruit-show suggested under 'Fruit Growing,' say in September, the cultivators would become interested in the industry in a very short time. The nomads appear to go in for it more than the settled population.

(xii) *Road-making*.—All large villages should be gradually connected with grand trunk roads by means of metalled roads at Government expense, and agriculturists belonging to the nearest villages should be employed thereon in preference to outsiders.

(xiii) *Silk-worm rearing* is another industry which should appeal to agriculturists and their women folk in Baluchistan. The mulberry tree is indigenous to Baluchistan and grows luxuriantly with little attention in most soils. Silk-worm rearing was started in Kalat some years ago when Colonel Showers was Political Agent there, and proved quite a success. After his departure the industry was allowed to die out. If a few mulberry planta-

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tions are laid out as an experiment on the same plan as those fostered in India for this purpose, there is every reason to believe that it would prove a profitable venture.

(xiv) *Tanks* should be constructed during the slack season. A series of them might profitably be made at suitable intervals along both sides of the numerous flood-channels which exist all over the country. This would give employment both to cultivators and their plough-bulls. The work of selecting and marking out their sites and disposing of the water, and, when necessary, of leasing the tank beds themselves for cultivation after the water has been run off, should be entrusted to the Irrigation Department. The fact that the land may, in places, consist of gravel or sand, should not be considered an objection to the construction of a tank; it is better for the flood water to percolate into the land under your own control, replenish your subsoil supply and gradually, through the cultivation encouraged thereon, assist in making the atmosphere in your valleys more humid, than to let it run off to other territories, where there is no guarantee that it will be utilised.

(xv) *Woollen Mills and Wool Cleaning*.—This is an industry which might be encouraged. Baluchistan is a wool producing country and seems to me essentially a place where its manufacture into blankets and cloth should be encouraged. There is already a wool-cleaning factory at Yaru, about twenty miles from Quetta by road and some inducement might be held out to capitalists to establish woollen mills either there or nearer Quetta, this would provide permanent employment for a large number of the inhabitants of this part of the country, some of whom would doubtless come from the agricultural class. But to make such a venture a real success, every effort should be made to conserve our rainfall, extend our forests, and thereby increase our rainfall. Given a more regular rainfall, hills and valleys would rapidly become covered with grass and supply an abundance of grazing for sheep, without having to trespass on forest areas.

(c) The want of an assured and abundant supply of water is the only real obstacle to the successful development of the various industries named above. Bee-keeping has been tried, but has not proved a success in the Quetta valley. The cause of failure is undoubtedly the dry climate and small rainfall. Increase our rainfall, and clover and other flowering plants, which grow readily wherever there is an abundant supply of water, will spring up naturally or could be successfully cultivated.

Pisciculture also depends on the water supply. It has been tried, with success, on a very small scale at Hurnai, where there is more water than is found in most places in Baluchistan.

(d) The sun-flower grows without any trouble in the Quetta valley and might be cultivated for its oil, in which case oil-pressing machines might be introduced profitably. Experiments in this direction would be very useful.

(h) Could not special prizes be offered to cultivators to build houses on more sanitary lines? Or a model sanitary village might be built in a central place and the inhabitants of the locality induced to move into it on the hire purchase system.

QUESTION 18.—*AGRICULTURAL LABOUR*.—(a) (ii) There are large tracts of culturable land lying uncultivated in Baluchistan owing to the want of an assured and ample supply of water, while near by are mountain ranges which offer scope for the construction of every form of water-saving device, from terraces on the hill-slopes to dams for large reservoirs, and for the simultaneous planting of forest growth. Begin serious operations in both these directions and the agricultural population will soon make its appearance.

(b) and (c) The above remarks apply here also.

QUESTION 19.—*FORESTS*.—(a) There is no question of forest lands being put to their fullest use for agricultural purposes. We want more forests in Baluchistan; it is essential for its proper development that no means should be left untried for the encouragement of forest growth all over the country. In the first place what is wanted is a complete staff of forest officers in Baluchistan, their strength being gauged not by the areas now actually under forest growth, but by the areas which should be covered with such vegetation and by a sense of our responsibility to see that Baluchistan,

which has been for so many years neglected in this respect even though under our administrative and political control, is given the full benefit of all our light and knowledge as regards the value of forests in the economic development of a country. If our Political Officers have been prevented by political considerations for India from doing all that they would like to have done in the direction of the development of Baluchistan it is high time that all such restraint should be removed and that they should now be given a free hand to do what they know is needed. Give them advisers of experience. Provide Baluchistan with all the facilities it needs for the afforestation of Baluchistan and the conservation of our wasted rainfall. Appoint complete circles of forest and irrigation officers; give them clear instructions that they must work conjointly; provide funds liberally for the construction of terraces, bunds and dams simultaneously all over the country wherever they would serve a useful purpose and if any irrigation expert condemns such plans because of the fear of silt, tell him that he must trust to the growth of forest vegetation to reduce such silt to a minimum. It would even pay the country better to sacrifice a large and costly silted-up reservoir to forest growth than to refrain from the expenditure of money on it for fear of the collection of silt.

(b) As regards firewood, agriculturists should be induced to reserve a certain portion (say one-tenth) of their own land for the growing of their own timber [see reply to Question 17, (b) (vi)].

As regards fodder it is for Government first to take action as suggested at (a) above, when the natural increase of rainfall will provide all the fodder necessary.

(c) Deterioration of forests has undoubtedly led to soil erosion and will continue to do so to the end of time. It is high time we made use of our knowledge of this well-known fact and gave proof of our wisdom in a practical way by re-establishing forests under the guidance of trained forest officers. (Notes by Mr. E. A. Smythies, I.F.S., give practical suggestions in this direction with which I fully agree.*) Make Baluchistan a forest circle, provide it with a full staff of first class officers, rangers, etc., and see that their advice for the exclusion of grazing from all new forest areas, for such period as they consider imperative, is strictly carried out. The longer this is done the better. Maintenance of forest growth will reduce damage from floods to a minimum.

(d) The supply of moisture in the soil can be increased by its cultivation. If the land is waste or fallow it should still be broken up with the plough once or twice a year and where the slope is heavy terraces should be formed. Soil thus broken up will absorb and retain a great deal more moisture than a hard unbroken surface from which the rainfall merely runs off. Pressure must be brought on landowners to ensure that they plough up all their waste land every year. Where they are too poor, Government should assist them. The same should be done in the case of all Government waste land, bullocks being taken on hire from the nearest agriculturists. There is much waste land in the country which cultivators claim as theirs but which they have never attempted to cultivate.

They should be given a certain number of years within which to bring such land under crop by rotation and to keep the remainder duly ploughed up. Failing this all land not ploughed up should become Government property and be made over by them to others who will cultivate it. My suggestions for afforestation with the object of increasing the rainfall will be found under Question 19 (a). The same methods would be useful in preventing the destruction by erosion of agricultural land.

(e) There is ample scope for schemes of afforestation in the neighbourhood of many villages in Baluchistan.

QUESTION 24.—ATTRACTING CAPITAL.—(a) Baluchistan, like Palestine, offers the capitalist every phase of climate with the additional advantage of peace and security assured by British control. Given an abundant and constant supply of water, it is capable of producing the finest and the most wonderful range of fruit, the most wholesome of vegetables and the best of cereals,

* Indian Forest Records, Vol. VII, Part VIII.

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fodder and grazing. In the higher altitudes we grow, in the way of fruit, almonds, apples, apricots, cherries, damsons, grapes, nectarines, peaches, pears, plums, pomegranates and quinces; and in the way of timber trees, robinia pseudacacia, cedar, chinar, deodar, horse chestnut, juniper, mulberry, poplar, pine and willow. At lower altitudes we grow sweet limes, oranges, mangoes, etc., in the way of fruit and, in the way of timber trees, most of the Indian varieties, such as the arjun, babul, banyan (bor), eucalyptus, mandi, nim, pakur, pipal, siris, shisham and tamarisk. It is also possible to grow the finest English vegetables both at the high and low altitudes, in their season.

With all these advantages in its favour, it must indeed be a world-wide marvel why more capitalists are not flocking to it. But without the one thing needful, viz., water, capitalists will not venture. If only Government will do their part in building terraces, bunds and dams in all the mountain ranges with which the country abounds and in planting forest-growth in their neighbourhood, under the direction and supervision of fully qualified staffs of irrigation and forest officers working in conjunction with each other, the result will be an increased and more regular rainfall, more humidity in the atmosphere and an absence of those late spring frosts which are now so ruinous to all enterprise in the direction of fruit culture.

(b) The absence of an assured and abundant water supply and the repeated failure in consequence of crops for the want of one or two waterings in the hottest season of the year are the prime factors tending to discourage owners of agricultural land from carrying out improvements. In fact the majority have been ruined and have no funds to carry out any improvements.

APPENDIX.

The Administrative Divisions of British India with their Area and Population.

Divisions.	Area (in square miles).	Population (1921 Census).	Acres per man.	REMARKS.
Madras Presidency	142,260	42,318,985	2.15	The first three columns have been taken from Mr. C. W. E. Cotton's "Handbook of Commercial Information for India". The fourth column has been worked out from the figures given by him. It will be noticed that Baluchistan is worse than the Andaman and Nicobar Islands.
Bombay Presidency, including Sind and Aden.	123,621	19,348,249	4.09	
Bengal Presidency	76,843	46,695,536	1.05	
United Provinces	106,295	45,375,787	1.50	
Punjab	99,846	20,685,024	3.09	
Burma	233,707	13,212,192	11.32	
Bihar and Orissa	83,161	34,002,189	1.57	
Central Provinces, including Berar.	99,876	13,912,760	4.59	
North-West Frontier Province.	13,419	2,251,340	3.80	
Baluchistan*	54,228†	420,648	82.5	
Ajmer-Merwara	2,711	495,271	3.5	
Coorg	1,582	163,838	6.18	
Delhi	593	488,188	0.77	
Andaman and Nicobar Islands.	3,143	27,086	74.27	
Assam	53,015	7,606,230	4.46	

* The Baluchistan Agency, with its headquarters at Quetta, was established early in 1877 by Sir Robert Sandeman.

† This excludes the Indian States of Kalat and Las Bela the combined area of which was given as 80,410 square miles in 1921 (see Census of India, Volume IV, Baluchistan, by Major T. C. Fowle, I.A., and Rai Bahadur Diwan Jamiat Rai, C.I.E.).

Oral Evidence.

A.3692. *The Chairman:* Mr. Cumming, you are retired Extra Assistant Commissioner in Baluchistan?—Yes.

A.3693. You have been good enough to give us a note of the evidence that you wish to give, as to the agricultural conditions in Baluchistan. Do you desire to make any addition or correction to that at this stage?—I have got out information from various Administration Reports, which might be of interest to you.

A.3694. How would you like to communicate it to us?—I could give you a copy.

A.3695. Perhaps, you could give it in writing. We could hardly examine you on that?—Yes.*

A.3696. Would you give the Commission, quite shortly, an account of your own service in Baluchistan?—I was born in Karachi in 1866. I joined Government service in 1884, and from 1884 to 1890 worked in Karachi. On the 17th of December 1890, I went to Quetta, and I have been there now for thirty-six years.

A.3697. You are now resident in Quetta?—Yes.

A.3698. I suppose the aggregate cost of the various schemes for agricultural improvement, including the irrigation schemes that you recommend, would be considerable?—It would be, undoubtedly.

A.3699. Meantime, the figures at our disposal go to show that the actual revenue from Baluchistan last year was £110,000, while over and above that the Government of India spent a sum of £476,000 upon the administration of the tract?—Yes.

A.3700. That is a deficit administration?—It is. The expenditure is in excess of the receipts.

A.3701. Those facts, no doubt, have their bearing upon the views which the Government of India might take as to further expenditure?—Doubtless; but on the other hand, it is just possible that they have not quite looked at the value of forests not only to Baluchistan, but to India.

A.3702. You base part of your case for afforestation in Baluchistan upon the theory that further afforestation would lead to further rainfall?—Undoubtedly.

A.3703. You adhere to that view?—I adhere to it.

A.3704. How about the readiness of the population which consists, I think, of about 430,000 souls, to take advantage of agricultural opportunities as against pastoral? Are they mainly a pastoral people to-day?—They are both pastoral and agricultural.

A.3705. You think there is sufficient population able and willing to take advantage of the increased agricultural opportunities that would flow from the adoption of your recommendation?—I should say that if they adopted my recommendation the population would increase tremendously.

A.3706. That is what I expected you to say. Would you expect immigration or an increased birth-rate?—I expect a great many of the residents of Baluchistan, who are continually migrating to the Punjab and Sind during seasons of distress, would return to their own country. In times of stress men from Kachhi and Sibi migrate to Sind and the Punjab. These men I expect would be only too glad to return.

A.3707. I observe from your note of evidence that you are strongly of opinion that the agricultural research branch in Baluchistan should be strengthened?—That is my opinion.

A.3708. Mr. and Mrs. Howard were for a number of years working at a farm in certain seasons of the year in Baluchistan? Did it bear good fruit?—It did bear good fruit for several years, but I cannot say that I am quite satisfied with the present working of this farm.

A.3709. It is important to know whether the varieties recommended by Mr. Howard have proved to be satisfactory varieties of fruit trees and crops?—I think the majority of the varieties that he recommended are suitable. But

* Not printed.

taking, for instance, my own experience, the class of plum trees that he recommended are not successful; I am gradually weeding them out of my orchards because of the fact that they are attacked by sparrows and flying beetles; I derive hardly any profit, but they grow beautifully; I am gradually weeding them out as not being profitable.

A.3710. There has been a marked increase in the quantity of fruits raised in Baluchistan of late years I understand?—I should say so, certainly.

A.3711. What markets are served?—We send our fruit all over India, and with the help of the refrigerating vans supplied by the railway I think our fruit reaches Calcutta and Bombay safely.

A.3712. Have you any local system of refrigeration or cold storage?—We have ice manufactured in Chaman and Quetta, and the refrigerating vans are filled with ice in both these places.

A.3713. And the fruit is not chilled until it is introduced into the railway van?—No; we have no local refrigerating systems.

A.3714. Is it your view that there is much to be done in the way of improving the technique of the packing of the fruit?—I think the system introduced by Mr. and Mrs. Howard is as good as we need at present.

A.3715. What containers do you use?—We have boxes made of strips of light wood, and also cardboard boxes, which Mr. Howard, I think, introduced from England; they have also very light punnets, which, I think, Mr. Howard introduced from Scotland. Now a great many of the boxes are made locally by local carpenters.

A.3716. What do you say about the services of the railways as regards the carriage of fruits?—I have nothing to complain of; they run special fruit trains.

A.3717. Are you satisfied with the price that you obtain?—Not locally; I believe those who send their fruit down country do profit by it; the local grower does not profit so much as the intermediary.

A.3718. Do you regard fruit-growing as a suitable subsidiary occupation to a man's main occupation?—I certainly regard it as a suitable subsidiary occupation, provided ample water is supplied. We must have a permanent guaranteed supply of water.

A.3719. Take the case of a cultivator engaged in the raising of crops; do you think that that cultivator, with his family, can give sufficient attention to fruit trees to enable him profitably to embark upon fruit-growing on any considerable scale?—As a matter of fact there are numerous cultivators in Baluchistan who have orchards in addition to their ordinary cultivation.

A.3720. And they find that they can give attention to pruning and so on?—I cannot say that they do give sufficient attention to pruning. It is for this reason that I would like to see the establishment on the Government experimental farm increased.

A.3721. Is it within your knowledge that these cultivators who have orchards as well as farms do, in fact, make money out of their orchards?—That also depends upon the class of fruit grown. Take, for instance, vine cultivation; they certainly do make money when the fruit crop is not injured by frost.

A.3722. In the main, however, I gather from your note that it is water that is required, and it is your view that irrigation should precede every other development?—That is my view.

A.3723. Do you know whether a detailed survey from that point of view has been made of the country?—In the papers that I have given you (which I have taken from Government records, Baluchistan Administration Reports for many years back) you will find the names of numerous schemes of irrigation which have been taken up from time to time, and that the cost of them has been worked out.

A.3724. I will turn to that later: I do not know whether we can examine you in detail on that. Do you know whether it is estimated that any of those schemes will be capable of becoming paying concerns?—When such an

expert as Sir John Benton, K.C.I.E., Inspector General of Irrigation, gave it as his opinion that they would be successful, they should be.

A.3725. Successful in what sense?—In commanding a very large area and successfully irrigating it.

A.3726. Has he suggested that Government would be able to recover interest and administration charges from the cultivators enjoying the water?—I think so.

A.3727. Cannot you speak with confidence?—I have no doubt about it.

A.3728. Meanwhile irrigation is mostly by *karezes*?—By *karezes* and springs.

A.3729. The departmental note tells us that the local cultivator is indissolubly wedded to that system of irrigation; do you agree with that?—It is only the very wealthy among the cultivators who are able to go in for the construction of *karezes*.

A.3730. You point out the well known weaknesses of that system?—I call it an iniquitous system.

A.3731. The gradual decline of each shaft reduced the water-producing capacity, gradually lowering the level of the sub-soil water and leading consequently to the desertion of the higher tracts?—Quite so.

A.3732. Has any alternative suggestion for tapping the subsoil water been put forward?—They have tried numerous artesian wells, but after a few years they have generally refused to function.

A.3733. Dried up?—They have not dried up; they have failed to function. The head, I suppose, has not been sufficient to lift the water above the surface. We have recently had to sink a well around one of our artesian wells, and I am getting a very good supply of water in the well itself, but we have to lift this by means of a Persian wheel; doubtless an oil engine would be more satisfactory.

A.3734. The schemes of irrigation, which you have in mind, all contain the element of storage, I take it?—They do.

A.3735. You have given an interesting note, on page 111 of your memorandum, about agricultural industries. You mention "brick-making, burnt and sun-dried"; is that art practised to-day? Do they make bricks?—They make bricks all round Quetta, but it is mostly in the hands of contractors.

A.3736. Is there a demand for burnt bricks?—A very great demand all round Quetta and near the railway line.

A.3737. Are the industries you mention all your own ideas, or have you seen these industries existing?—They are my own ideas.

A.3738. For basket-making do you get willows?—That is being gradually reduced.

A.3739. They are making baskets?—Yes; but most of our baskets come from down country, from Shikarpur in Sind.

A.3740. How about afforestation about which you speak?—As regards forests, I certainly think that we should have our forest officers working in conjunction with our irrigation officers.

A.3741. Given perennial irrigation in consequence of water storage, do you think the Baluchi cultivator can be persuaded to set aside a part of his land for growing timber?—I think it should not be difficult to convince him of the benefit that he would derive from it.

A.3742. But with water available the temptation is to grow a money crop, is it not?—That is doubtless the case; but within a few years even timber would pay, within five years or six.

In the meantime they will have to wait for the money.

A. 3743. As regards poultry rearing, has any attempt been made to improve the breeds of fowls?—Yes. Locally we have very fine white and black leghorns?

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A.3744. Where do they come from?—From different parts of India.

A.3745. Have you ever heard of the work being done in Lucknow in connection with the improvement of the breeds of fowls?—I have heard, and I think some of the birds have come all the way from Lucknow.

A.3746. Have you heard of Mrs. Fawkes?—I do not go in for poultry myself, so I do not know.

A.3747. How about the standard of diet in Baluchistan? Is it high, middling, or low?—Very low.

A.3748. What grain?—They eat chiefly wheat in Baluchistan; but a great many of the nomads who came from the plains of Sibi and Kacchi eat *juari*.

A.3749. You mention the making of tanks as a subsidiary industry. Is there any tradition of small storage schemes in Baluchistan? Do you see small streams *bunded*?—I have mentioned tanks with the object of holding up flood water. They have at Suranan no less than four tanks, three of which have been successfully filled in seasons of flood.

A.3750. Do you think there is any future for sheep in Baluchistan?—Undoubtedly, if we increase our rainfall. We have got excellent sheep in Baluchistan; they are very fat.

A.3751. What is the small experiment with pisciculture that has been made at Hurnai?—There are two tanks in Hurnai where they have hundreds of fish; I think they were brought there by some *fakir*.

A.3752. Are they sacred fish?—Yes.

That does not appear to offer a contribution towards the food supply of the country?

A.3753. Dr. Hyder: Does the Pathan eat fish?—Not that I know of.

A.3754. Why does he not eat fish?—I have never heard of his eating fish; but I have not taken the trouble to enquire.

A.3755. The Chairman: Turning to another subject, is erosion of good agricultural land going on at the moment?—A great deal of it; even within the vicinity of Quetta you see erosion going on.

A.3756. How about firewood? Is that got from slopes?—Most of our firewood comes from Sind. During the war there was a time when Quetta ran short of firewood, and while I was City Magistrate I was entrusted with the duty of obtaining carriage for the different contractors from the various firewood stations in Sind.

A.3757. Is there any scrub jungle on the slopes of the hills?—In places.

A.3758. Is it cut for firewood?—Yes; for instance we have got on the higher altitudes juniper and wild almond; on the lower slopes there is a species the name of which I do not know.

A.3759. What is your opinion of the Baluchi as a cultivator?—In Baluchistan we have the Baluchi, the Brahui and the Pathan. We find that they all engage in cultivation as well as keeping flocks. Even the local men have their flocks of sheep and send them out with their servants to graze.

A.3760. What about the other tribes?—All of them, Pathans, Brahuists and Baluchis, go in for both cultivation and flock-keeping. The Marris in the Sibi district go in more largely for flock-keeping, for the simple reason that they have very little water for irrigation purposes, the greater portion of it passing through their country on to the plains.

A.3761. There are one or two statements in the official memorandum which I should like to ask you about. It is stated: "there are no signs of agricultural indebtedness among the land owning classes except perhaps in the neighbourhood of Quetta and the other centres of the Province." Do you agree?—I speak only of Quetta, and I see that they are very heavily indebted.

A.3762. You cannot speak for the population away from Quetta?—Not with any authority. Excuse me; in the Sibi valley there is a great deal of indebtedness.

A.3763. Among the landowning classes?—Yes. The landowning classes borrow money to sink their *karezes*, and the *karezes* after a few years become useless.

A.3764. *The Raja of Parlakimedi*: Is fruit-growing a popular avocation among the Baluchis?—It is a popular avocation among the people round Quetta and at Gulistan and Pishin.

A.3765. Is it common to all the three tribes you have mentioned?—The Pathans and the Brahuis go in for it now.

A.3766. Do they go in for bee-keeping?—The people of the country know absolutely nothing about the honey bee. I was the first to introduce honey bees into Quetta and after I had managed to keep them going for a couple of years, we were fortunate in getting an expert as curator of the McMahon Museum, Quetta. He knew from experience how to manage bees, and he kept them going for several years more; but, because of the scarcity of wild flowers, due to the shortage of rainfall, bee-keeping had to be given up.

A.3767. *The Chairman*: From where did you take the bee to Quetta?—From Kashmir, and some from Simla.

A.3768. *The Raja of Parlakimedi*: What fruits do the local people grow largely as a rule?—Apricots, almonds, apples, pears and plums; but, as I have already said, I do not consider that the plum is a paying fruit.

A.3769. Grapes?—Grapes also are grown very successfully, especially *kismis* and the long white grape.

A.3770. There is always a ready market for the yearly product I suppose?—Yes, in Sind, the Punjab and all over India.

A.3771. How much could a grower get per acre?—That all depends upon the variety grown and the class of irrigation.

A.3772. Under normal conditions?—Under normal conditions the *kismis* grape pays well.

A.3773. Would you call it the most paying fruit?—I should think so; the seedless grape is the most profitable.

A.3774. You mentioned that you grew lucerne to improve saline soils. Have you tried growing gram and ploughing it in?—No.

A.3775. That is also a nitrogenous plant?—I have not experimented with it.

A.3776. What other fodder crops have they in addition to lucerne?—Wheat and occasionally barley.

A.3777. As fodder?—Yes. Barley is used chiefly as green fodder. Wheat, of course, is grown for its grain and *bhusa*. The price of *bhusa* at present is something like two rupees eight annas per maund.

A.3778. Do they grow the plant which is called *senji* in the Punjab?—I am sorry I do not know.

A.3779. It is a fodder crop grown in the Punjab?—I could not tell you. While Mr. Howard was here he was very successful in growing clover, but it is not popular for the simple reason that it wants a great deal of water and requires re-sowing every year.

A.3780. I do not think *senji* requires much irrigation; I think it only requires it at the early stage?—I do not know it by that name.

A.3781. *Sir James MacKenna*: What proportion of the male population of Baluchistan go through the Army?—I am sorry I am unable to tell you. All I know is that during the War the Brahuis of the Kalat State sent in some recruits, besides contributing very largely in many ways towards the cost of the War. May I read a brief portion of the Government records?

A.3782. *The Chairman*: Please?—“In 1914-15 the prompt declaration of their unswerving loyalty to the Crown and the proffer of their persons and resources in the service of the Empire by His Highness the Khan of Kalat, the Jam of Las-Bela and the chiefs, on the outbreak of war, awoke a sympathetic echo throughout Baluchistan, and the fact that amid all the turmoil in the world the year's history in Baluchistan was an undramatic history of peace and quiet, momentarily disturbed only by such occasional ruffling as

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is incident to the frontier, speaks eloquently for the deep seated loyalty of its Pathan, Baluch and Brahui tribesmen. This declaration of loyalty was early followed by the proffer of a Kalat-Lasbela camel corps of two thousand camels. Besides the Camel Corps, His Highness the Khan offered an aeroplane costing Rs. 33,750 to the British Government as a help in the Great War, and the offer was gladly accepted by the Government. In honour of the visit of the Agent to the Governor General to Kalat (28th August to 1st September, 1916) His Highness the Khan of Kalat contributed ten thousand rupees from his private purse towards the War Fund, together with one hundred camels, while two lakhs from Niabat funds, one lakh from the funds administered by the Political Agent, Kalat, as well as fifty thousand rupees on behalf of Sardars and headmen were invested in the Indian War Loan. In May 1917, one hundred camels were supplied by the Kalat State in aid of the War at a cost of Rs. 14,415-3-2. Vegetables of all sorts were cultivated over an area of one hundred acres in Mastung and Dhadar Niabats for the use of British troops. Vegetables worth twenty thousand rupees were supplied to the military authorities at Quetta from the middle of May 1917 to the end of October 1917.”

A.3783. *Sir James MacKenna*: But the general position is that there is very large recruitment, even in the piping times of peace, to the Army from Baluchistan, is there not? There is a very considerable recruitment of your male population to the Baluchi Regiments?—I cannot speak with authority, but I believe a great deal of recruiting does take place.

A.3784. And therefore a great deal of money goes back to the country from the savings of these soldiers? What about the Howards: what was the arrangement for propaganda work in connection with their experiments?—They not only experimented with various kinds of plants and crops, but they used to publish bulletins.

A.3785. That is not much use among the Baluchis, is it?—Those bulletins were translated into the vernacular.

A.3786. Do you think they had any influence outside that particular area?—I believe they had an influence; it has certainly made itself felt in the packing industry.

A.3787. Yes, I think that is possible. On the other hand, the standard of fruit cultivation in Quetta was very high, was it not, even before the Howards went there? The sort of question I have often put to people I have known in Quetta is: “Do you know anything about the Howards' fruit?” They would reply: “No, but we get the most excellent fruit in Quetta.” I might say that since the Howards started the Government experimental fruit farm in Quetta, a large number of the zamindars have gone in for fruit culture and have purchased thousands and thousands of plants from the experimental fruit farm.

A.3788. That means that the Howards have had an influence on the neighbourhood. Who is carrying on the work now?—An Indian trained in Pusa.

A.3789. Trained by the Howards?—No, trained in the Research Institute at Pusa.

A.3790. That is where the Howards were?—Yes, possibly.

A.3791. Was he selected by Mr. Howard, do you know?—I think so. I think he was there before the Howards left.

* Note by witness: I have specially brought these facts to notice in order to arouse our sense of honour. These practical demonstrations of loyalty by a poverty stricken people, at a critical moment in our national life, seem to demand from us, in peace time, some practical expression of our grateful appreciation commensurate with our reputation as a great Christian nation. If the principle embodied in the illustration of the poor widow's mite be taken as a guide, these people are deserving of the very best return we can make them. And I cannot conceive of anything finer than the introduction throughout Baluchistan of the most up-to-date schemes of irrigation and forest development that the best of our experts are capable of working out.

A.3792. Is the garden maintaining its utility?—It has been since they have reduced expenditure. For instance, at first they put in charge of the farm over this trained man from Pusa an Extra Assistant Commissioner who, I am afraid, was no authority on the subject of fruit growing; but now they have this trained man in charge and I understand he is making it pay.

A.3793. And carrying it on on sound lines?—Yes.

A.3794. What are the main export fruits: the hard fruits or the soft fruits?—Both hard and soft, dry as well as fresh.

A.3795. You do a certain amount of fruit drying, do you?—The natives have a primitive way of drying fruit in the sun; they have not yet introduced amongst the people the evaporating ovens that are used elsewhere.

A.3796. Baluchistan seems to be a very pleasant land except for this water trouble?—That is the only flaw.

A.3797. I am afraid your hopes of attracting capitalists, as you say, are likely to end in nothing unless you produce the water?—That is essential.

A.3798. What you apparently want is the Italian system of terracing?—Terracing and erecting dams and *bunds*.

A.3799. You have no revenue?—It would bring in a revenue. But you have to obtain from somewhere your original capital.

A.3800. *Professor Gangulee*: Do you find large orchards coming into existence in Baluchistan?—Yes, several new orchards are springing up all about Quetta.

A.3801. From where do they get the nursery stock?—A great deal of it from the Government fruit farm and some from private nurseries which have started since the fruit farm came into existence.

A.3802. Are these private nurseries in any way controlled by the Government service?—No.

A.3803. Who run these private nurseries?—Indians.

A.3804. Baluchis?—No, people of the country and some retired officials, but people of the country generally.

A.3805. That is, the Baluchi fruit grower can buy his stock either from the Government station or from private nurseries?—Yes.

A.3806. You are not aware of the nature of the work in which the successor of Mr. Howard is engaged?—His successor is engaged in carrying on the experimental farm.

A.3807. You have known Baluchistan for a long time; could you tell us whether the standard of living of the average Baluchi cultivator has improved or not?—The cost of living has increased but I am afraid the majority of the men are poverty stricken.

A.3808. But why? They serve in the army, they get money and you say fruit growing is being extended and so on; to what do you ascribe the fact that they are poor?—Because of the insufficiency of water; the water supply is absolutely insufficient.

A.3809. But their incomes have increased, have they not? If, as you say, fruit growing has been extended, and, as Sir James MacKenna says, many soldiers are recruited from the Baluchis, which means more money, why are they poor?—I cannot express an opinion as to the extent of recruiting, but so far as fruit cultivation is concerned it is mainly confined to some of the wealthy zamindars.

A.3810. *Sir Thomas Middleton*: The total area commanded by canals in Baluchistan is, I see from your statement, about 130,000 acres?—Yes, 133,436 acres for all Baluchistan canals.

A.3811. I want to get from you some estimate of the quantity that is irrigated by these *karez*es?—I am sorry I have not got it.

A.3812. Can you give me a very rough idea? Is there half as much irrigated from the *karez*es as there is from the canals?—I should not think so; I am sorry I have not come prepared with that information.

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A.3813. The total area cultivated in Baluchistan is about 336,000 acres?—Yes.

A.3814. Is there much land cultivated in Baluchistan except under irrigation?—There is a good deal of cultivation where there are *karez*es and springs.

A.3815. That is by irrigation?—Yes.

A.3816. Have you any land cultivated under rainfall?—We have a great deal; in fact most of Baluchistan consists of *khushkaba* land which depends entirely upon rainfall.

A.3817. In view of the revenue which Baluchistan pays, it is clear that you cannot have the extensive Department of Agriculture that you would like to have to aid you in your fruit growing. Beyond getting Mr. and Mrs. Howard from Pusa, have you taken any steps to use Pusa in other ways to assist your work. For example, you ask for soil analysis; why do you not send your soils to Pusa to be examined?—With a laboratory and a chemist available in Quetta, the people of the country, especially those living round Quetta, would be induced to come to it, but they have no idea of sending to Pusa.

A.3818. I am thinking of growers like yourself. I suppose there are a few pioneer fruit growers. How many are there, like yourself, growing fruit round Quetta?—There are only a few Europeans, three or four, but of course a large number of natives.

A.3819. You Europeans want assistance: why do you not form a small society, get into communication with Pusa and ask them to help you with your difficulties?—They could not help us with regard to the water question.

A.3820. And until you get water you can do nothing?—Our efforts are limited.

A.3821. They could help you with regard to insect pests, surely?—In what way?

A.3822. They could advise you how to treat insect pests?—They might be able to tell me how to treat the green fly, but they could not tell me how to deal with the cicada or the beetle or other insects that breed in the soil. I believe the only way to deal with these is to plough up the surface soil.

The Chairman: Why not try Pusa? It will not cost you more than the stamp.

A.3823. *Sir Thomas Middleton*: I think that instead of calling out for new departments at Quetta, where there is such a small group of growers to be aided, you should get together and see what help you can get from institutions in other Provinces and from Pusa. They cannot send you water but they might be able to send you some helpful advice?—They might. When we know that many of these insects breed in the soil, we know that what is wanted is cultivation of that soil, and I do not know that Pusa can tell me anything more than that in this direction. They might be able to classify a beetle or a certain insect that I may send to them, but as regards telling me how to destroy those insects, I do not believe they can tell me more than I already know on the subject.

A.3824. You suffer from spring frosts?—We do.

A.3825. Have you ever tried smudging on the American plan: fires?—I have tried that, but unfortunately my garden is about five miles from me, and when frost takes place it takes place suddenly at night and I do not happen to be on the spot. I have myself tried staying up for half the night, but I have never been able to rely on my gardener carrying it on for the rest of the night.

A.3826. So that, there, it is not advice you want but a gardener who will rise when it freezes?—Yes, but the main way, I should say, of dealing with the spring frosts is more water, flooding the land, increasing the cultivation all round and increasing the humidity in the atmosphere.

Yes, for vegetables, but for trees you must use a smoke screen.

A.3827. *Dr. Hyder*: You have had thirty-six years of service. Do you know all parts of Baluchistan?—No, by no means.

A.3828. You mentioned irrigation; have you been in the Chaghai district?—I have been in the Chaghai district both before and after the railway was constructed.

A.3829. Do not you think the water is brackish?—Not in every place.

A.3830. Have you ever drunk the water?—Certainly; in Nushki some of the water is impregnated largely with sulphate of magnesia and certainly is not pleasant drinking; but that does not mean that all the water about that area is similarly impregnated.

A.3831. Is not the water of the stream you mentioned brackish?—Yes; I suppose it gets that brackish taste from the soda salt in the soil over which it flows? There are certain belts in which you find more soda salts than in others.

A.3832. What is the working life of the *karez*?—I should say about twenty or thirty years; some may be forty or fifty years old.

A.3833. Do not you think denudation of the hillsides is going on. You know the hills round about Quetta?—Yes.

A.3834. You know that a good portion of the fuel is brought from those hills?—The juniper wood, a kindling wood, is brought from the hills, but our hard wood comes entirely from Sind.

A.3835. Do you think you could stop this practice of cutting these trees round about Quetta?—By reserving certain areas?

A.3836. You have been an officer in Baluchistan?—Yes.

A.3837. What I want to know from you is whether matters have advanced so far that you could tell the tribesmen that a portion is reserved and they have no more right of entry?—I think a great deal depends upon the Political Officer responsible for these things. You might be able to reserve a forest for a certain number of years; but when they are suffering from scarcity the first thing they ask is that they may be permitted to graze their flocks in the reserved forests; a great deal of damage is done in years of scarcity.

A.3838. With regard to the income and expenditure of this Frontier Administration, do not you think that a good portion of the expenditure is not for the purposes of Baluchistan but for the general purposes of the Indian Empire. There are the subsidies given to the different Chiefs, the policing of the different routes, maintenance of roads, and a number of other things. Do not those things come under the general purposes of the Indian Empire?—I quite agree with you that Baluchistan has a greater claim on India than India has any idea of.

A.3839. They keep the door there closed. As regards the moneylending to which the Chairman referred, you have been an officer among these tribes and you know them. Do you not think the *bania* is a very highly respected member of their community; that whoever may be killed, the *banias* will never be touched?—I have known instances in which the *bania* has bolted from his shop.

A.3840. Occasional raiding?—No, not occasional raiding; where he has been a little too exorbitant.

A.3841. But not where he has behaved?—No; he is a very respected member of the community.

A.3842. He will never be killed?—Yes, I believe you are right there; where he behaves himself reasonably, certainly.

A.3843. *The Chairman*: What is behaving oneself in Baluchistan: about thirty per cent?—I think the rate of interest varies from twelve-and-a-half to seventy-five per cent.

A.3844. *Dr. Hyder*: What departments have you in Baluchistan with which this Commission is concerned. Have you any department of agriculture?—We have no department of agriculture; we have one Irrigation Officer of the lowest grade and one Forest Officer of the lowest grade. I personally

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believe the latter is a Forest Ranger promoted to the rank of Extra Assistant Commissioner for Baluchistan. In the circumstances what can the local Government do?

A.3845. Baluchistan depends largely upon dry cultivation?—Yes, I have already said so: *khushkaba*.

A.3846. Has not the Irrigation Department looked into this matter at all with the help of science?—I cannot say that they have not looked into the matter; a large number of schemes have been gone into, have been put forward and approved, but for some reason or other they have not been carried out.

A.3847. You have sheep there which give very good wool?—Yes.

A.3848. And very good mutton?—Yes.

A.3849. Have you anybody who can advise the people of Baluchistan as regards their chief stock of wealth?—We have annually three cattle or horse shows. We have horse shows at Quetta, Sibi and Gumbaz, and, at both Sibi and Quetta, sheep and cattle are also exhibited.

A.3850. But is there any Government agency which enters into the life of these people?—We have remount and veterinary officers.

A.3851. But no one to advise them as regards the improvement of sheep?—Not that I know of.

A. 3852. In parts of Baluchistan the chief wealth is sheep?—I should say that sheep are a very great source of wealth.

A.3853. How does the Brahui entertain when anybody visits him? All he does is to slaughter a sheep for his guest; that is the best he can do?—He feeds you roast mutton.

A.3854. There are some questions in this provincial memorandum to which reference has been made. Why were some of these canal works abandoned?—I really cannot explain. In one instance I know of, the zamindars raised the objection that the *bunds* would supply only clear water and deprive them of the silt which usually comes down with the floods; they said they would not be able to cultivate the crops every year on the same soil once the silt was stopped, as they are now able to do. But I think that objection could easily be explained away: they get clear water from the *karez* system, they get clear water from springs, and why should not they be satisfied with clear water from reservoirs.

A.3855. Do you agree with the statement made in this memorandum that what the country requires is a well thought-out irrigation programme conceived and sanctioned in no niggardly spirit and carried through under the supervision of an irrigation expert?—I absolutely agree with that.

A.3856. You think that the chief need of Baluchistan is an expert irrigation officer?—Undoubtedly.

A.3857. That is what the people would also desire?—They would welcome it.

A.3858. Turning to the causes of indebtedness, you have an intimate knowledge of the tribal confederacy of the Brahuis?—I have some knowledge of it.

A.3859. You mention the practice of paying bride money. Is it confined to the Pathans, or is it also in vogue among the Brahuis?—I believe it is general. It is chiefly among the Pathans; I will not say that the Brahuis and Baluchis do not go in for it.

A.3860. Have you got a school in Baluchistan?—We have numerous schools in Baluchistan.

A.3861. Is the Sandeman school a high school still?—Yes.

A.3862. It has not been raised to the status of an intermediate college?—No.

A.3863. Do the Brahuis send their sons to school?—Yes. We have students from all parts of Baluchistan, and there are hostels for both Hindus and Mahomedans.

A.3864. Do you think primary education is making any headway among the tribes?—I should think so. They send their children to school. They have got primary schools.

A.3865. You have said something about seasonal migration. You said that the people from the plains move up to the highlands. Is it the custom that the Brahui moves in winter into the plains, and when the plains heat up he goes back to the highlands?—In spring he comes up to the highlands, and in the autumn he goes down to the plains.

A.3866. So that the migration is always from the mountains to the plains?—Yes, and *vice versa* according to season.

A.3867. It is the same population that goes back?—The nomad population.

A.3868. There is no other population that moves into Baluchistan?—I should think, so far as Quetta itself goes, there is.

A.3869. I am not talking about Quetta but of the tribal territory?—No. They are residents of Baluchistan.

A.3870. *Sir Thomas Middleton*: Have these nomad tribes chiefly got goats and sheep, or cattle?—Chiefly sheep; some of them have cattle. In the Kachhi, you get a very fine breed of cattle, and they take their cattle to Sind for sale.

The Witness: May I ask that the starting of irrigation works in Baluchistan may be recommended. I think it is essential both for Baluchistan itself and for India.

(The witness withdrew.)



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Moneylenders, *Jamiat Rai* (94); *Cumming* (108); Shopkeepers, Taccavi, Tribes-
 men, local, Wool dealers, *Jamiat Rai* (94).
 Talukdars' Loans Regulation (Ajmer), *Bal Kishan* (81-4).
 Talukdars' Relief Act, extension necessary, *Bal Kishan* (70).
 Transfer of Property Act, not appreciably effective, *Bal Kishan* (69).
 Usurious Loans Act, ineffective, *Bal Kishan* (69).

AGRICULTURAL INDUSTRIES : (see also under CUMMING).**COTTAGE INDUSTRIES :**

Co-operative marketing suggested, *Bal Kishan* (70).
 Study recommended, *Bal Kishan* (71) (79).
 Famine relief works ineffective, *Bal Kishan* (71-2) (75).

FRUIT GROWING : (see also under RESEARCH).

in Ajmer-Merwara :

in Hilly tracts of Merwara, suggested, *Shuldham* (57).
 Hindered by limited water supply, *Bal Kishan* (75).

in Baluchistan :

Irrigation necessary, *Jamiat Rai*, 3652-6.
 Plantation on large scale necessary, *Jamiat Rai*, 3690.
 Military service as a subsidiary occupation in Ajmer-Merwara, *Bal Kishan* (75) 3594-6.
 Mills, *Bal Kishan* (75).
 Scarcity years, subsidiary occupations in Ajmer-Merwara, *Bal Kishan* (74-5).

AGRICULTURAL LABOUR :

Development of uncultivated land in Baluchistan depends upon water supply, *Cumming*
 (113).

MIGRATION :

in Baluchistan, *Cumming*, 3704-6, 3865-70.
 in Famine times in Ajmer-Merwara, *Bal Kishan* (75).
 Soldiers, returned, *Jamiat Rai*, 3662-4.
 Wages paid in kind in Baluchistan, *Jamiat Rai* (90) (95) 3680-1.

AGRICULTURAL SERVICE :

Department, establishment of, in Ajmer-Merwara, with co-operation of Delhi and Indian
 States, recommended, *Shuldham* (52-3) 3461-9.
 Engineer, agricultural mechanical, required in Ajmer-Merwara, *Shuldham* (53).
 Finance and staff inadequate in Ajmer-Merwara, *Shuldham* (52) 3509-14, 3461, 3521-6.
 Government of India : experts should assist in Ajmer-Merwara, *Shuldham* (52) 3465-7,
 3509-14.
 Inadequate in Baluchistan, *Cumming* (105-6) 3844.

AJMER-MERWARA :

Agricultural conditions and rural economy, *Bal Kishan* (74-9).
 System of administration, *Shuldham*, 3462-4.

ANIMAL HUSBANDRY :

Breeding of sheep and goats in Baluchistan : taccavi recommended, *Jamiat*
Rai, 3674-7.
 Bulls, maintenance of, at veterinary centres, recommended, *Shuldham* (57).
 Castration, propaganda by co-operative societies recommended, *Shuldham* (57).

CATTLE :

in Baluchistan, *Cumming*, 3870; Insurance a failure, *Bal Kishan* (75); Mortality
 heavy in Ajmer-Merwara : Numbers increased in Ajmer-Merwara, *Bal Kishan* (75).

CATTLE-BREEDING :

Ajmer-Merwara unsuitable for, *Bal Kishan* (75).
 Fodder difficulty in Baluchistan, *Cumming* (111).

DAIRYING :

Director of, suggested, *Edwards* (20).
 Improvement of breeds necessary, *Shuldham* (57).
 Experts, touring, necessary, *Shuldham* (57).

FODDER :

Crops, see under **CROPS AND CROP PROTECTION**.
 Grass storage recommended, *Shuldham* (57) 3492-3, 3536-7.
 Scarcity :
 in Baluchistan, *Cumming* (111).
 Greatest in May and June in Ajmer-Merwara, *Shuldham* (57).
 Water supply necessary in Baluchistan, *Cumming* (111).

HORSE-BREEDING :

in Baluchistan, *Jamiat Rai*, 3683.
 Fodder difficulty in Baluchistan, *Cumming* (111-2).
 Landowners, methods of encouraging to take interest, *Shuldham* (57).
 Pasture, paucity of, in Ajmer-Merwara, *Bal Kishan* (75) 3585-6.

SHEEP :

Taccavi for breeding recommended, *Jamiat Rai*, 3674-7.
 Water supply necessary in Baluchistan, *Cumming* (113) 3750, 3704-6, 3759-60,
 3847-53, 3870.
 Shows recommended, *Shuldham* (57); *Cumming*, 3849.
 Veterinary, should be closely linked with, *Edwards* (20).

BAL KISHAN, Registrar, Co-operative Societies, Ajmer-Merwara, Ajmer (65-89).

Experience, 3552-5, 3604.

(The evidence of this witness refers to Ajmer-Merwara)

ADMINISTRATION :

Posts and Telegraphs :
 Post offices : very few in rural areas (75).
 Telegraph offices, practically none in rural areas (75).
 Transport : Roads (75).

BAL KISHAN—contd.**AGRICULTURAL INDEBTEDNESS :**

Causes of borrowing : financing of agriculture, thriftiness, old debts, ignorance as to profitability or otherwise of agricultural operations, social customs, marriage expenses (69) (70), smallness of income (68) (70) 3603.
Extent of : 85 to 95 per cent of agriculturists heavily in debt (76) 3619-24.

Insolvency :

Calvert's scheme (70) (84) (76).

Measures for lightening agriculture's burden of debt :

Amendment of Usurious Loans Act, Punjab Redemption of Mortgages Act, compelling moneylenders to keep accounts, extension of Talukdars Relief Act, compulsory elementary education (70) ; Janch Committees (69-70) (79-80) 3275-77.

Land Alienation Act (69) 3582-3.

Moneylenders :

Account-keeping irregular (67).

Character of borrower not considered (67).

Interest excessive (67).

Land passing into the hands of (76).

are Middlemen (75-6).

Unproductive purposes, give loans for (67).

Moneylending, very lucrative (68) (75-6) 3587.

Mortgages, non-terminable, prohibited by Land Alienation Act (71).

Punjab Redemption of Mortgages Act, necessary (70).

Repayment in Ajmer-Merwara prevented by : Crop failures (69) 3603, inferior cultivation, accumulated interest, accumulated indebtedness leading to despair, ignorance of accounts, alcoholic drink (69).

Shop credit, ruinous effects of (68) (75-6).

Sources of credit : Moneylenders, joint stock banks, agricultural banks, Government co-operative credit societies, zamindars (66) (68).

Talukdars' Loans Regulation (Ajmer) (81-4).

Talukdars Relief Act, extension necessary (70).

Transfer of Property Act, not appreciably effective (69).

Usurious Loans Act, ineffective (69).

AGRICULTURAL INDUSTRIES :**Cottage industries :**

Co-operative marketing suggested (79).

Study recommended (71) (79).

Famine relief works ineffective (71-2) (75).

Fruit growing, hindered by limited water supply (75).

Military service as a subsidiary occupation (75) 3594-6.

Mills (75).

Scarcity years, subsidiary occupations (74-5).

AGRICULTURAL LABOUR :

Migration in famine times (75).

AJMER-MERWARA :

Agricultural conditions and rural economy (74-9).

ANIMAL HUSBANDRY :**Cattle :**

Insurance a failure (75).

Mortality heavy in Ajmer-Merwara (75).

Numbers increased (75).

Cattle-breeding : Ajmer-Merwara unsuitable for (75).

Pasture, paucity of (75) 3585-6.

CO-OPERATION :

Agricultural societies (77).

Audit :

Government should pay for (72) 3588-91.

Reserves absorbed by expenses of (77) 3588-91.

BAL KISHAN—contd.**CO-OPERATION—contd.**

Better farming society at Beawar (66) (73).

Cattle breeding societies in Merwara (73) 3595-6.

Cattle insurance a failure (75).

Central Banks :

Deposits at cheap rates, 3571-3, 3610.

Directorship satisfactory, 3564.

Dividend, 3599-600.

Interest rates, 3610.

Primary societies financed, 3574.

Credit societies :

Government help recommended (66).

Indebtedness of societies, 3556-7.

Managing committees, 3613-4.

Progress (68) (72-3) (76-8) 3562-3.

Repayment not always punctual, 3558, 3567, 3611-4.

Reserves absorbed in administrative expenses (77).

most suitable means of financing cultivators (66-7).

Finance : Government grants recommended (72).

Fodder storage societies (78).

History of (76-7) 3572-3.

Illiteracy an obstacle (73).

Improvement societies (73).

Indian States, co-operative education in Chief's College recommended (79).

Interest :

Co-operative rates decreased, 3568-70, 3610.

Moneylenders' rates decreased, 3565-6.

Irrigation societies (78).

Jats as co-operators, 3607-9.

Land transference from cultivators has been decreased (78).

Marketing (78).

Members :

Castes, 3607-9.

Education improving, 3559-61, 3592-3.

Non-officials : Government recognition recommended (72) 3584, 3605-9.

Objects, achieved by 10 per cent of credit societies (73).

Propaganda, Government grants recommended (72) (79) 3601-2.

Sheep-breeding societies, failure of (78).

Staff, Government :

Extension recommended (72-3) 3592-3.

Training in agriculture and animal husbandry recommended (72).

Suggestions as to (78).

Supply societies (78).

Thrift successfully taught (78).

CROPS AND CROP PROTECTION :

Output : total failure in more than a quarter of cultivated area (75).

DEMONSTRATION AND PROPAGANDA :

Better farming co-operative societies recommended (66) (73).

Centralised village demonstrations ineffective (66).

Co-ordination of Agricultural and Co-operative Departments recommended (66).

Cultivator willing to adopt improved methods if proved to give good results (66).

Model holdings recommended (66).

Propaganda recommended (66) 3601-2.

EDUCATION :**Adult :**

Co-operative, recommended (65) 3616-8.

Agricultural :

no Arrangements for (65).

Vocational, in rural middle schools, recommended (66).

BAL KISHAN—contd.**EDUCATION—contd.**

- Compulsory elementary education :
 - Recommended (65) (70).
 - Restriction to one male child in each family suggested (71) 3580-1, 3615.
- Literacy :
 - Co-operation prevented by lack of (73).
 - Improvement of condition of rural population would result from increase of (65) (78-9).
 - Proportion among agricultural classes of Ajmer-Merwara, one-half per cent (65).
- Methods, investigation as to, recommended (79).
- School plots recommended (66).
- Schools :
 - Hours should be suitable to agricultural requirements (65) (70).
 - More required (65).
 - Proximity to village important (65) (70-1).
- Teachers : popularity, importance of (65).

FINANCE :

- ordinary Banks of little use to cultivators (67).
- Government loans direct to cultivators not recommended (67).
- Taccavi : Co-operative distribution recommended (67-8).

HOLDINGS :

- Area (74) (76).
- Fragmentation, Ajmer Land and Revenue Regulation ineffective (71) (84).

IRRIGATION :

- Sources (74).
- Tanks, control by village committees recommended (71).
- Wells :
 - Boring Department recommended (71).
 - Exploration of subsoil water recommended (71).
 - Rainfall uncertainty a difficulty (71) (74).
 - Rocky soil a difficulty (71).

SOILS :

- Poor (74).

VETERINARY :

- Dispensaries : None in villages (73).

WELFARE OF RURAL POPULATION :

- Alcoholic drink evil (69-70).
- Development department, none to give expert advice (73) (75) (78) 3597-8.
- Disease :
 - Indigenous methods recommended (74).
 - Mortality heavy (73-4).
- Dispensaries, few (73).
- Economic condition of ryots, 3619-24.
- Famine (71-2) (75) 3567.
- Health propaganda by rural community councils recommended (74) 3605-6.
- Population (74).
- Research, economic, recommended (74).
- Women, low percentage of population (70) 3578-9.

BALUCHISTAN :

- Administration, *Jamiat Rai* (89-90) 3685-7 ; *Cumming* (115) 3838-9, 3844.
- Economic possibilities, *Cumming* (114-5) 3796-9.
- Population, *Cumming* (115).
- Revenue :
 - in Kind, *Jamiat Rai* (90) 3670-1.
 - Less than expenditure, *Jamiat Rai*, 3626-30, 3678-82, 3684 ; *Cumming*, 3698-701, 3838-9.

BORROWING, see under AGRICULTURAL INDEBTEDNESS.**BUNDS, see under IRRIGATION.****CAPITAL, ATTRACTING OF, TO AGRICULTURE.**

- Improvements prevented by : size of holdings and indebtedness, *Shuldham* (57-8).
- Restriction as to alienation, removal of in the case of capitalist cultivators, suggested, *Shuldham* (57) 3498, 3532-3, 3538-49.
- Scoops for, in Baluchistan, *Cumming* (114-5).
- Water supply necessary in Baluchistan, *Cumming* (115) 3796-9.

CATTLE, see under ANIMAL HUSBANDRY.**CINCHONA, see under COWAN.****CONSOLIDATION (of holdings), see under HOLDINGS.****CO-OPERATION : (See also under BAL KISHAN).**

- in Baluchistan, no organisation, *Jamiat Rai*, 3672-3, 3687.
- Castration, propaganda recommended, *Shuldham* (57).
- Implementa, propaganda recommended, *Shuldham* (55).
- Progress : not run on sound lines in the past, *Shuldham*, 3495-7.
- Seed distribution recommended, *Shuldham* (55).

COTTON, see under CROPS AND CROP PROTECTION.**COWAN, Dr. J. M., M.A., D.Sc., officiating Director, Botanical Survey of India (1-12).****CINCHONA :**

- Centralisation :
 - Imperial Cinchona Department, formation of, suggested (6), 3233.
 - Necessity for, (5), 3203-05.
- Cultivation :
 - Conditions essential for growing Cinchona (3).
 - Cultivation by Government, as also private owners subsidised by Government recommended, 3208.
 - Control of — by Botanical Survey with help of Forest Department, 3218-25.
 - Experimental work, need for (5).
 - Extension, possibility of, in India (3-7). Assam (4-5), Bengal (4-5), Burma (4) 3235-36, South India (3-4) 3228, in the Empire, 3212-14.
 - History of (1-2).
 - Soils, suitable for (3) 3226-27.
 - Species planted (2-3).
- Distribution :
 - Complicated at present (7).
 - System suggested, 3197.
- Java :
 - Contract should be renewed, 3202, 3206-7.
 - Produces over 90 per cent of world's output (2).
 - Manufacture, 3191-2, 3203-4.
 - Price, 3191-5, as compared with Java, 3211.
 - Effect of — on consumption, 3238-39.
- Research, need for (6) :
 - Centralisation recommended, 3215.
 - Kind of, needed, 3216-17.
- Staff (7), 3215.
- Supply :
 - India's demand, possibility of supplying demand in India, 3187-88, 3198-3201.
 - Need for taking steps to increase, 3237.
- Survey :
 - by Col. Gage (2), 3209-10, 3235.
 - by Forest Department, desirability of, 3231.

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COTTON : *See also under CULTIVATION and RESEARCH.*

Extension in Baluchistan recommended, *Jamiat Rai* (95).
Improvement effected in Ajmer-Merwara, *Shuldham* (55) 3527-31.
Wilt disease, American *Buri* cotton free from, *Shuldham* (51) (53).
Cultivators in Baluchistan, *Cumming*, 3704-6, 3759-60.
Fodder crops in Baluchistan, *Cumming* (105) 3774-80.
Groundnut, very paying, *Shuldham* (55).
Improvements possible, *Shuldham* (55).
New crops introduced in Baluchistan, *Jamiat Rai* (95).
Output: in Ajmer-Merwara total failure in more than a quarter of cultivated area, *Bal Kishan* (75).

PIGS, WILD :

much Damage caused by, *Shuldham* (55).
Government action necessary, *Shuldham* (55).

RICE :

Extension in Baluchistan recommended, *Jamiat Rai* (95).
Improvement, scope for, in Baluchistan, *Jamiat Rai* (95).

SEED DISTRIBUTION :

Co-operative, recommended, *Shuldham* (55).
Moneylenders adulterate and sell at high prices, *Shuldham* (55).
System not working smoothly, *Shuldham* (55) 3534-5.
as *Taccavi* in Baluchistan recommended, *Jamiat Rai* (95).
Tobacco, experiments as to, in Ajmer-Merwara, *Shuldham* (55).

CULTIVATION :

Cotton sowing in lines recommended, *Shuldham* (55).
Hemp as a green manure recommended, *Shuldham* (54-5).

CULTIVATORS, *see under* DEMONSTRATION AND PROPAGANDA.

CUMMING, J. W. N., Retired Extra Assistant Commissioner, in Baluchistan, Quetta (103-26).
(*The evidence of this witness refers to Baluchistan.*)

ADMINISTRATION :

Transport :
Railways :
Fruit carriage satisfactory, 3716.
Sand for soil improvement carriage of, at reduced rate, recommended (106).
Roads : Extension necessary (106).

AGRICULTURAL INDEBTEDNESS :

Causes of borrowing : insufficient water-supply, lack of subsidiary employment (*see AGRICULTURAL INDUSTRIES*), bride-price (107-8) 3858-9, construction of *karez*, 3763.
Extent of, 3761-3.
Moneylenders, 3839-43.
Repayment prevented by lack of assured water supply (108).
Sources of credit : generally moneylenders (108).

AGRICULTURAL INDUSTRIES :

Basket-making : Water-supply for growth of willows necessary (111) 3738-9.
Bee-keeping :
Unsuccessful in Quetta valley (113) 3766-7.
Water-supply necessary (113).
Brick-making :
Recommended (111) 3735-7.

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AGRICULTURAL INDUSTRIES—contd.

Brick-making—*contd.*
Tank excavation should be associated with (111).
Carpentry : Village forests necessary (111).
Fruit :
Afforestation necessary (112). (*See under FORESTS*) ; Drying, 3795 ; Frosts (104-5) 3824-6 ; Government Experimental Farm, extension recommended, 3720, 3806 ; Marketing, 3711-7, 3770-3 ; Nurseries, 3800-6 ; Packing, 3714-5 ; Peats : ploughing of waste land recommended (107) ; Popular, 3764-5 ; Progress, 3707-10 ; Pusa, of doubtful assistance, 3817-23 ; at Quetta (104-5), 3800 ; Railway service satisfactory, 3716 ; Refrigeration, 3711-3 ; Research, *see under that head* ; Shows recommended (105) (112) ; a Subsidiary occupation, 3718-22, 3807-9 ; Varieties grown, 3768-73, 3794 ; Water supply necessary, 3718, 3722.
House-construction : Prizes recommended (113).
Indebtedness would be decreased by subsidiary industries (111).
Irrigation bund construction in Baluchistan recommended (112).
Leisure period in Baluchistan : none where there is permanent water supply ; 7 or 8 months on land dependent upon rainfall (111).
Oil-pressing :
Experiments recommended (113).
Sunflower cultivation in Quetta valley possible (113).
Pisciculture :
Successful on a small scale at Hurnai (113) 3751-4.
Water supply necessary (113).
Pottery recommended (112).
Poultry-rearing :
Breeds, 3743-6.
Recommended (112).
Shows recommended (112).
Reclamation of land as an employment in the slack season recommended (107).
Road making in slack season recommended (106) (112).
Sericulture :
Mulberry grows well in Baluchistan (112-3).
Recommended (112-3).
Tank excavation, *see under IRRIGATION*.
Terracing hillsides as an employment in the slack season recommended (107) (112).
Woollen mills and wool cleaning, recommended (113).

AGRICULTURAL LABOUR :

Afforestation as an employment in the slack season recommended (107).
Development of uncultivated land depends upon water supply (113).
Migration, 3704-6, 3865-70.

AGRICULTURAL SERVICE : Inadequate (105-6) 3844.**ANIMAL HUSBANDRY :**

Cattle, 3870 ; Cattle-breeding, fodder difficulty (111).
Fodder : Crops, *See under CROPS AND CROP PROTECTION*. Scarcity of (111). Water supply necessary (111).
Horse-breeding, fodder difficulty (111-2).
Sheep, water supply necessary (113) 3750, 3704-6, 3759-60, 3847-53, 3870.
Shows, 3849.

BALUCHISTAN :

Administration (115) 3838-9, 3844.
Economic possibilities (114-5) 3796-9.
Population (115).
Revenue less than expenditure, 3698-701, 3838-9.

CAPITAL, ATTRACTION OF, TO AGRICULTURE :

Scope for (114-5).
Water-supply necessary (115) 3796-9.
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CUMMING, J. W. N.—contd.

CROPS AND CROP PROTECTION :

- Cultivators, 3704-6, 3759-60.
- Fodder crops (105) 3774-80.
- Sunflower (oil-seed) in Quetta valley recommended (113).

DEMONSTRATION AND PROPAGANDA :

- Clover as fodder demonstrated at Quetta Government Experimental Farm (105).
- Fruit growing: demonstration at Quetta Government Experimental Farm (105).
- Shows: of Cattle, etc., 3849; of Fruit recommended (105) (112); of Poultry recommended (112); Twice yearly at Quetta recommended (105) (112).

EDUCATION :

- Schools in Baluchistan, 3860-4.

FERTILISERS :

- Artificial: Chemist in Quetta necessary (110).
- Cowdung:
 - Use of as fuel should be discouraged by afforestation to supply firewood (111)
 - Used for wheat, barley and lucerne round Quetta (110).
- Nightsoil of towns:
 - Sold by municipalities (110).
 - Used for vegetables round Quetta (110).

FINANCE :

- Taccavi:
 - without Interest recommended (106); Long-term necessary (106); Necessary (106); Repayment by small instalments necessary (106); Use of loans for unproductive purposes should be prevented (106).

FORESTS :

- Afforestation:
 - to prevent Cowdung being used as fuel (111); to decrease Dust storms (106)
 - to give Employment in slack season (107); to provide Firewood (106) (111)
 - on Holdings recommended (111) 3740-2; to increase Humidity (106) 3702-
 - Importance of (110) (113-4); Terracing on mountains recommended (112)
 - near Villages, ample scope for (111) (114).
- Carpentry, village forests necessary (111).
- Deforestation, 3833-7.
- Deterioration has caused erosion (114) 3755.
- Firewood: supply (106) (111) 3756-8.
- Grazing (107).
- Staff inadequate (108-9) 3844.
- Trees grown (115).

IRRIGATION :

- Basket-making, water supply for growth of willows necessary (111).
- Bunds:
 - Gravel, in river beds recommended (110).
 - Recommended (106).
 - as a Subsidiary industry recommended (112).
- Canals, area commanded, 3810-6.
- Fodder, water-supply necessary (111).
- Importance of (109) (115) 3796-9, 3808, 3845-6, 3854-7, 3870.
- Karezes (underground) should be discouraged (107) 3728-31, 3762, 3810-6, 3832.
- Reservoirs recommended (106).
- Schemes advocated (108) 3723-34, 3854-7.
- Staff inadequate (108-9) 3844, 3855-7.
- Survey necessary (100).

CUMMING, J. W. N.—contd.

IRRIGATION—contd.

- Tanks:
 - Excavation should supply clay for bricks (111).
 - Recommended (110) 3749.
 - as a Subsidiary employment recommended (113).
- Wells with bunds at higher levels recommended (110) 3732-4.

MARKETING :

- Fruit, *see under* AGRICULTURAL INDUSTRIES.
- Roads necessary (106).

RESEARCH :

- Fruit: (*See also under* AGRICULTURAL INDUSTRIES).
- Frost, as to protection against (104-5).
- Howard's work in Baluchistan, 3707-9, 3784-93.
- Pests, research necessary (104) 3707.
- Laboratory at Quetta, for chemical analysis of plants, soils and water recommended (103-4).
- Quetta Government Experimental Farm, extension recommended (105) 3720.

SOILS :

- Erosion caused by forest deterioration (114) 3755.
- Flooding to eradicate soda salt (103-4) 3827-31.
- Quetta, varying nature of (103-4) 3827-31.
- Reclamation: as a subsidiary occupation recommended (107).
- Waste land, compulsory ploughing recommended to improve soil, prevent erosion and destroy insect pests (107) (114).

WELFARE OF RURAL POPULATION :

- Diet very low, 3747-8.
- Drinking water, 3827-31.
- Military service, 3781-4, 3807-9.
- Populations of administrative divisions of British India (115).
- Poverty, 3807-9.
- Quarrels over women and water (108).

DAIRYING, *see under* ANIMAL HUSBANDRY.DEBTS, *see* AGRICULTURAL INDEBTEDNESS.

DEMONSTRATION AND PROPAGANDA :

- Better farming co-operative societies recommended, *Bal Kishan* (66) (73).
- Central Government's experts should assist, *Shuldham* (52).
- spasmodic demonstrations ineffective, *Bal Kishan* (66).
- Co-ordination of Agricultural and Co-operative Departments recommended, *Bal Kishan* (66).

CULTIVATORS :

- Example of model holdings important, *Shuldham* (52).
- Expert advice: guarantee against loss recommended, *Shuldham* (52).
- Willing to adopt improvements when satisfied of financial benefits, *Shuldham* (51-2); *Bal Kishan* (66).
- Farms, Government model, two necessary in Ajmer-Merwara, *Shuldham* (52).
- Fruit growing: demonstration at Quetta Government Experimental Farm, *Cumming* (105).
- Hemp, as a green manure: demonstration recommended, *Shuldham* (54).
- Implements: demonstration necessary, *Shuldham* (56).
- Model plots recommended, *Bal Kishan* (66).
- Propaganda by means of leaflets, demonstrations, magic lanterns, recommended, *Bal Kishan* (66) 3601-2.

DEMONSTRATION AND PROPAGANDA—contd.

SHOWS:

- of Cattle, etc., *Cumming*, 3849.
- of Fruit recommended, *Cumming* (105) (112).
- of Poultry recommended, *Cumming* (112).
- Twice yearly at Quetta recommended, *Cumming* (105) (112).

EDUCATION:

ADULT:

- Co-operative recommended, *Bal Kishan* (65) 3616-8.
- Necessary, *Bal Kishan* (65-6).

AGRICULTURAL:

- no Arrangements for in Ajmer-Merwara, *Bal Kishan* (65).
- Barnes (Anglo-Vernacular) Middle School at Sibi, *Jamiat Rai* (90) 3638-9, 3657-9.
- Careers, after, of pupils, generally not agricultural, *Jamiat Rai*, 3633-9, 3659.
- Extension recommended, *Jamiat Rai* (90) 3633-9.
- Free, recommended, *Jamiat Rai* (90-1).
- Fruit farming in Baluchistan recommended, *Jamiat Rai* (90).
- Handbook in Urdu recommended, *Jamiat Rai* (91).
- in Primary schools, should be compulsory, *Jamiat Rai* (91).
- no Schools solely devoted to agricultural education in Baluchistan, *Jamiat Rai* (90).
- Stipends recommended, *Jamiat Rai* (91).
- Teachers: training in fruit farming and veterinary knowledge recommended, *Jamiat Rai* (90).

COMPULSORY ELEMENTARY EDUCATION:

- Recommended, *Bal Kishan* (65) (70).
- Restriction to one male child in each family suggested, *Bal Kishan* (71) 3580-1, 3615.
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- Improvement of condition of rural population would result from increase of, *Bal Kishan* (65) (78-9).
- Proportion among agricultural classes of Ajmer-Merwara, one-half per cent. *Bal Kishan* (65).
- Mayo College, sons of chiefs should be taught value of improved methods, *Shuldham* (52).
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- Veterinary, should be closely linked with (20).

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Materials supplied by zamindar, *Jamiat Rai* (95).Payment in kind to blacksmith-carpenter, *Jamiat Rai* (90) (95) 3680-1.**PLOUGHS :**Importation into Baluchistan recommended, *Jamiat Rai* (95-6) 3640-1.Manufacture of iron ploughs in Ajmer-Merwara unsuccessful, *Shuldham* (56) 3480.Modern, recommended, *Shuldham* (55).Propaganda, Co-operative, necessary, *Shuldham* (56).Purchase in bulk recommended, *Shuldham* (56).Threshing machines recommended, *Shuldham* (55).Varieties used in Baluchistan, *Jamiat Rai* (95).**Weeding machines :**Manufacture in Ajmer-Merwara, *Shuldham* (56).Recommended, *Shuldham* (55) 3476-7.Winnowing machines recommended, *Shuldham* (55).

INOCULATION, *see under* VETERINARY.

IRRIGATION :

Basket-making water supply for growth of willows necessary in Baluchistan, *Cumming* (111).

Boring plant in Ajmer-Merwara, *Shuldham* (54) 3478-9.

BUNDS :

in Baluchistan recommended, *Cumming* (106).

Gravel, in river beds recommended, *Cumming* (110).

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Taccavi advances free of interest recommended in Baluchistan, *Jamiat Rai* (93).

Canals, area commanded in Baluchistan, *Cumming*, 3810-6.

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Finance, *Jamiat Rai*, 3626-30.

Fodder, water supply necessary in Baluchistan, *Cumming* (111).

Importance of, in Baluchistan, *Cumming* (109) (115) 3796-9, 3808, 3845-6, 3854-7, 3870.

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Karezes (underground) should be discouraged in Baluchistan, *Cumming* (107) 3728-31, 3763, 3810-6, 3832.

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Schemes advocated in Baluchistan, *Cumming* (108) 3723-34, 3854-7.

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Control by village committees recommended, *Bal Kishan* (71).

Excavation should supply clay for bricks, *Cumming* (111).

no Scope for further construction in Ajmer-Merwara, *Shuldham* (54).

as a Subsidiary employment in Baluchistan recommended, *Cumming* (113).

Taccavi advances free of interest recommended in Baluchistan, *Jamiat Rai* (93).

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Ajmer-Merwara :

Boring Department recommended, *Bal Kishan* (71).

Extension doubtful, *Shuldham* (54) 3478-9.

Exploration of subsoil water recommended, *Bal Kishan* (71).

Rainfall uncertainty a difficulty, *Bal Kishan* (71) (74).

Rocky soil a difficulty, *Bal Kishan* (71).

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with Bunds at higher levels recommended, *Cumming* (110) 3732-4.

JAMIAT RAI, Diwan Bahadur DIWAN, C.I.E., Retired Extra Assistant Commissioner, Quetta (89-102).
(*The evidence of this witness refers to Baluchistan*).

AGRICULTURAL INDEBTEDNESS :

Causes of borrowing :

Bride price (93-4), higher standard of life, seasons of scarcity (94).

Repayment prevented by :

Crop failures, cattle mortality and ceremonies (94).

Sources of credit :

Taccavi, shopkeepers, moneylenders, local tribesmen, wool dealers (94).

AGRICULTURAL INDUSTRIES :

Fruit-growing :

Irrigation necessary, 3652-6.

Large scale necessary, 3688-91.

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AGRICULTURAL LABOUR :

Soldiers, returned, 3662-4.

Wages paid in kind (90) (95) 3660-1.

ANIMAL HUSBANDRY :

Breeding of sheep and goats : taccavi recommended, 3674-7.

Horse breeding, 3683.

BALUCHISTAN :

Administration (89-90) 3685-7.

Revenue :

in Kind (90) 3670-1.

Less than expenditure, 3626-30, 3678-82, 3684.

CO-OPERATION :

no Organisation, 3672-3, 3687.

CROPS AND CROP PROTECTION :

Cotton :

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Previously grown at Sibi (95).

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Rice :

Extension recommended (95).

Improvement, scope for (95).

Seed distribution : as taccavi recommended (95).

EDUCATION :

Agricultural :

Barnes (Anglo-Vernacular) Middle School at Sibi (90) 3638-9, 3657-9.

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Free, recommended (90-1).

Fruit farming recommended (90).

Handbook in Urdu recommended (91).

in Primary schools, should be compulsory (91).

no Schools solely devoted to agricultural education (90).

Stipends recommended (91).

Teachers : training in fruit farming and veterinary knowledge recommended (90).

Employment of educated person, limited scope for (90).

Incentive of pupils, Government service (90).

FERTILISERS :

Cowdung used as manure and fuel (95).

Folding of sheep and goats (95).

Sewage water used in vicinity of Quetta (95).

Storage of nightsoil and rubbish in municipal pits in vicinity of Quetta (95).

FINANCE :

Taccavi :

to Breeders of sheep and goats recommended, 3674-7.

Improvement of land, rules and suggestions as to (91-3).

Interest low (91).

Repayment should be extended (91).

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Afforestation : taccavi loans conditional upon, 3643-51.

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- Marriage customs, effect of (94-5).
- Registration of transfers recommended (95).
- Women do not inherit (94-5).

IMPLEMENTS :

- Improvement, none (95).
- Manufacture in Baluchistan :
 - Materials supplied by zamindar (95).
 - Payment in kind to blacksmith carpenter (90) (95) 3660-1.
- cheap Ploughs : Importation recommended (95-6) 3640-1.
- Varieties used (95).

IRRIGATION :

- Finance, 3626-30.
- Tanks and bunds, taccavi advances free of interest recommended (93).

LAND TENURE :

- Rent in kind (90).

RESEARCH :

- Publication of results in Urdu recommended (90) 3631-2.
- Soils : investigation necessary (90).

SOILS :

- Classification of (90) (97-8) 3665-9.
- Publication of information in Urdu recommended (90).
- Research as to, necessary (90).

STATISTICS :

- Cattle census (97).
- Crop experiments : restriction to principal crops recommended (96).
- Crop inspections of doubtful utility (96).
- Irrigation : investigation as to produce of each unit of water recommended (96-7).
- Land revenue : no further information necessary (97).

VETERINARY :

- Department, 3674-7.
- Dispensaries, 3674-5.

WELFARE OF RURAL POPULATION :

- Conditions :
 - Backward (96).
 - Improvement, all round gradual, since British occupation (96).
- Drinking water : Impure (96).
- Dispensaries, travelling, recommended (96).
- Hygiene : Ignorance of (96).
- Indian Economic Enquiry Committee (96).
- Sanitary sub-inspectors under Medical Department recommended (96).
- Soldiers, returned, higher economic outlook, 3662-4.
- Survey, economic, recommended (96).

JERROM, J. H. G., I.V.S., Superintendent, Civil Veterinary Department, Sind and Rajputana (58-9) (*See also* **SHULDHAM, CAPT. W. F. Q.**).
(*The Evidence of this witness refers to Ajmer-Merwara.*)

VETERINARY :

- Contagious diseases :
 - Ignorance (58).
 - Indian States, influx of cattle from, to (58).
 - Legislation, difficulty of enforcing (58).
 - Notification, failure of (58).
 - Obstacles to dealing with (58).

JERROM, J. H. G.—contd.**VETERINARY—contd.****Department :**

- Expansion, none has taken place for many years (58).
- should be independent (58).

Dispensaries :

- District Board control at Ajmer (58).
- Extension urgently needed (58).
- Municipality control at Beawar (58).
- Propaganda necessary (58).
- Provincial control recommended (58).
- Touring by veterinary assistants, none (58).
- Use of, by agriculturists, small (58).

Inoculation :

- Fees are not and should not be charged (58-9).
- Prejudice against (58).

Muktesar Institute, extension advocated (59).

Research :

- further Facilities recommended (59).
- Provincial recommended (59).
- Serum : no difficulty in obtaining (58).
- Superior Veterinary Officer with the Government of India, appointment recommended (59).
- Veterinary Assistants :
 - Pay should be standardised (58).
 - Provincial control recommended (58).
 - do no systematic Touring (58).

LAND TENURE :

- Rent in kind in Baluchistan, *Jamiat Rai* (90).

MANURE, see FERTILISERS.**MARKETING :**

- Fruit, *see under* **AGRICULTURAL INDUSTRIES.**
- Information, of complaints as to Indian produce, should be given to cultivators, *Shuldham* (57).
- Roads necessary in Baluchistan, *Cumming* (106).
- Transport, improvement of, necessary, *Shuldham* (57).

MIGRATION, see under AGRICULTURAL LABOUR.**MONEYLENDERS, see under AGRICULTURAL INDEBTEDNESS.****MUKTESAR RESEARCH INSTITUTE, see under EDWARDS and JERROM.****PIGS, WILD, see under CROPS AND CROP PROTECTION.****PLOUGHS, see under IMPLEMENTS.****POSTS AND TELEGRAPHS, see under ADMINISTRATION.****RAILWAYS, see under TRANSPORT under ADMINISTRATION.****RESEARCH :**

- in Ajmer-Merwara, none, *Shuldham* (51).
- Cinchona, *Cowan* (6) 3215-7.
- Cotton disease, no investigation of, in Ajmer-Merwara, *Shuldham* (51) (53) 3499-505.
- Fertilisers, research recommended, *Shuldham* (55).

FRUIT :

- (*See also under* **AGRICULTURAL INDUSTRIES.**)
- Frost, as to protection against, *Cumming* (104-5).
- Howard's work in Baluchistan, *Cumming*, 3707-9, 3784-93.
- Pests, research necessary, *Cumming* (104) 3707.
- Indore Research Station, Ajmer-Merwara, has received no assistance from, *Shuldham*, 3499-502.

RESEARCH—contd.

- Institute at Ajmer-Merwara :
 - Advocated, *Shuldham* (51) 3461.
 - Indian States should contribute, *Shuldham*, 3468-9, 3506-8.
- Laboratory at Quetta, for chemical analysis of plants, soils and water recommended, *Cumming* (103-4).
- Publication in Urdu recommended, *Jamiat Rai* (90) 3631-2.
- Pusa, assistance to Ajmer-Merwara suggested, *Shuldham*, 3470-3.
- Quetta Government experimental farm, extension recommended, *Cumming* (105) 3720.
- Soils in Baluchistan, investigation necessary, *Jamiat Rai* (90).
- Tobacco, research as to, taking place in Ajmer-Merwara, *Shuldham* (55).

RICE, see under **CROPS AND CROP PROTECTION**.

ROADS, see under **TRANSPORT** under **ADMINISTRATION**.

SCHOOLS, see under **EDUCATION**.

SEED, see under **CROPS AND CROP PROTECTION**.

SHEEP, see under **ANIMAL HUSBANDRY**.

SHOWS, see under **DEMONSTRATION AND PROPAGANDA**.

SHULDHAM, Captain W. F. Q., I.A., Assistant Commissioner, Ajmer-Merwara (51-65).
(See also **JERROM**.)
(The evidence of this witness refers to Ajmer-Merwara.)

ADMINISTRATION :

- System of administration, 3462-4.
- Transport :
 - Marketing, motor service necessary (57).
- Roads :
 - District Board, not to blame for unsatisfactory condition (53) 3516-20.
 - Forests, roads necessary (55) 3492-4.
 - Government of India criticised (53) 3516-20.

AGRICULTURAL INDEBTEDNESS :

- Causes of borrowing : Famines, scarcity and ceremonies (53).
- Improvements prevented by (57-8).
- Measures for lightening agriculture's burden of debt :
 - Punjab Redemption of Mortgages Act, Government long-term loans through co-operative societies, Land Alienation Act (54) 3498, 3532-3, 3538-49.
- Repayment prevented by famines and scarcity (53).
- Sources of credit : village moneylenders, Co-operative societies and taccavi (53).

AGRICULTURAL INDUSTRIES :

- Fruit growing in hilly tracts of Merwara, suggested (57).

AGRICULTURAL SERVICE :

- Department, establishment of, with co-operation of Delhi and Indian States, recommended (52-3) 3461-9.
- Engineer, agricultural mechanical, required (53).
- Finance inadequate (52) 3509-14, 3521-6.
- Government of India experts should assist (52) 3465-7, 3509-14.
- Staff : Inadequate (52) 3461, 3521-6.

ANIMAL HUSBANDRY :

- Bulls, maintenance of, at veterinary centres, recommended (57).
- Castration, propaganda by co-operative societies recommended (57).
- Dairying, improvement of breeds necessary (57).
- Experts, touring, necessary (57).
- Fodder :
 - Grass storage recommended (57) 3402-3, 3536-7.
 - Scarcity greatest in May and June (57).
 - Landowners, methods of encouraging to take interest (57).
- Shows recommended (57).

SHULDHAM, Capt. W. F. Q.—contd.**CAPITAL, ATTRACTING OF, TO AGRICULTURE :**

- Improvements prevented by size of holdings and indebtedness (57-8).
- Restriction as to alienation, removal of, in the case of capitalist cultivators, suggested (57) 3498, 3532-3, 3538-49.

CO-OPERATION :

- propaganda for Castration, through co-operative societies, recommended (57).
- Implements, propaganda through co-operative societies, recommended (56).
- not run on Sound lines in the past, 3495-7.

CROPS AND CROP PROTECTION :

- Cotton :
 - Improvement effected (55) 3527-31.
 - Wilt disease, American Buri cotton free from (51) (53).
- Groundnut very paying (55).
- Improvements possible (55).
- Pigs, wild :
 - much Damage caused by (55).
 - Government action necessary (55).
- Seed distribution :
 - Co-operative recommended (55).
 - Moneylenders adulterate and sell at high prices (55).
 - System not working smoothly (55) 3534-5.
- Tobacco, experiments as to (55).

CULTIVATION :

- Cotton sowing in lines recommended (55).
- Hemp as a green manure recommended (54-5).

DEMONSTRATION AND PROPAGANDA :

- Central Government's experts should assist (52).
- Cultivators :
 - Example of model holdings important (52).
 - Expert advice : guarantee against loss recommended (52).
 - Willing to adopt improvements when satisfied of financial benefits (51-2).
- Farms, Government model, two necessary (52).
- Hemp, as a green manure : demonstration recommended (54).
- Implements : demonstration necessary (56).
- Potatoes to be tried in hilly tracts of Merwara (55).

EDUCATION :

- Mayo College, sons of chiefs should be taught value of improved methods (52).

FERTILISERS :

- Bone :
 - Co-operative encouragement recommended (54).
 - no Prejudice against, 3474-5.
- Cowdung, use of, as fuel : firewood and charcoal supply necessary (55).
- Green : hemp recommended (54-5).
- Research necessary (55).

FINANCE :

- Long-term Government loans recommended (53-4).

FORESTS :

- Firewood : supply necessary to discourage use of cowdung as a manure (55).
- Roads necessary (55) 3492-4.

HOLDINGS :

- Consolidation :
 - Co-operative suggested (54).
 - Difficulty (54).

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IMPLEMENTS :

- Demonstration at model farms and on holdings recommended (56).
- Importation (56).
- Ploughs :
 - Manufacture of iron ploughs in Ajmer-Merwara unsuccessful (56) 3480.
 - Modern, recommended (55).
- Propaganda, co-operative, necessary (56).
- Purchase in bulk recommended (56).
- Threshing machines recommended (55).
- Weeding machines :
 - Manufacture in Ajmer-Merwara (56).
 - Recommended (55) 3476-7.
- Winnowing machines recommended (65).

IRRIGATION :

- Boring plant (54) 3478-9.
- Exploration of underground water in Beawar by Government recommended (54).
- Improvement, scope for (54).
- Pumping plant, demonstration of (54) 3550-1.
- Tanks : no scope for further construction (54).
- Wells, extension doubtful (54) 3478-9.

MARKETING :

- Information, of complaints as to Indian produce, should be given to cultivators (57).
- Transport, improvement of, necessary (57).

RESEARCH :

- in Ajmer-Merwara, none (51).
- Cotton disease, no investigation of (51) (53) 3499-505.
- Fertilisers, research recommended (55).
- Indore Research Station, Ajmer-Merwara has received no assistance from, 3499-502.
- Institute at Ajmer-Merwara :
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GLOSSARY.

- Abi Cultivation in tank beds.
 Arjun A large deciduous tree (*terminalia arjuna*).
 Babul A widely distributed small tree (*acacia arabica*).
 Bania A Hindu trader who is generally also a moneylender.
 Barani Unirrigated land depending on rain for its water supply.
 Bhumia A landlord, proprietor of the soil.
 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 five-eighths of an acre; a *kutchha bigha* is in some places one-third, in others one-fourth, of a standard *bigha*.
 Bund A dam, a field embankment.
 Buri A variety of cotton imported from America (*gossypium hirsutum*).
 Chahi land Land irrigated from wells.
 Chinari A large deciduous tree (*platanus orientalis*).
 Dahana A local unit of measurement of irrigation water; also, the land irrigated by such a unit. The *dahana* consists of a number of *paos*, and the *pao* of a number of *rakkis*. The number of *paos* to the *dahana*, and of *rakkis* to the *pao*, varies from village to village.
 Dal A generic term for various pulses.
 Drab A fodder grass (*erugrostis cynosuroides*).
 Fakir A Mahomedan ascetic.
 Ghi Clarified butter.
 Gowshala A refuge home for cattle.
 Hakim A practitioner of one of the Indian systems of medicine.
 Husiyat A statement of assets and liabilities.
 Ilaka A district, jurisdiction.
 Istimrardar The holder of a lease granted in perpetuity.
 Istimrari A term applied to the permanent settlement of the revenue.
 Jagir An assignment of the revenue of a given area of land.
 Jagirdar A large holder of land granted on special terms for services rendered, or the holder of any assignment of revenue.
 Jhil A shallow lake, a swamp.
 Jirga A council of the village elders.
 Juar The large millet (*sorghum vulgare*).
 Kamin A menial.
 Karez A system of irrigation used where sharp slopes make it possible to bring sub-soil water to the surface by horizontal shafts.
 Khalsa Lands or villages held immediately of Government.
 Kharif The autumn harvest; crops sown at the beginning of the rains and reaped in October-December.

Khasra	. . .	A record of the village lands in which the fields are numbered.
Khushkaba	. . .	Unirrigated land depending on rain for its water supply.
Kismis	. . .	The dried fruit of <i>vitis vinifera</i> .
Kumri	. . .	Temporary cultivation in jungle clearings.
Lath Bandi	. . .	The occupancy right of a person who, by embanking a field, makes it fit for cultivation.
Lumbardar	. . .	A cultivator who pays the Government dues either on his own account or as the representative of other members of the village.
Ma Bap	. . .	Literally, mother and father; a protector.
Mahajan	. . .	A merchant, moneylender.
Mahal	. . .	A district or province.
Makki	. . .	Maize (<i>zea mays</i>).
Maund	. . .	A measure of weight of 82.28 lb. (<i>pucca maund</i>); has different values for different commodities and for the same commodity in different localities.
Mofussil	. . .	The country as opposed to the town.
Mulla	. . .	A Mahomedan teacher who teaches in a mosque.
Mung	. . .	Green gram (<i>phaseolus radiatus</i>).
Naib	. . .	A deputy or assistant.
Nim	. . .	A large forest tree (<i>acadirachta indica</i>).
Pakur	. . .	A cultivated tree (<i>ficus infectoria</i>).
Panch, Panchayat	. . .	Literally a committee of five; used to describe an association of any number of persons instituted for objects of an administrative or judicial nature.
Pao	. . .	See Dahani.
Patwari	. . .	The village accountant or registrar.
Pipal	. . .	A sacred tree (<i>ficus religiosa</i>).
Rakhi	. . .	See Dahana.
Ryot	. . .	A cultivator.
Sailaba	. . .	Land irrigated by floods or percolation from a river.
Senji	. . .	A fodder crop (<i>melilotus parviflora</i>).
Seth	. . .	A merchant or banker.
Shaftal	. . .	A fodder crop (<i>trifolium resupinatum</i>).
Shisham	. . .	A deciduous tree (<i>dalbergia sissoo</i>).
Sir Panch	. . .	The chief of the Panch.
Siris	. . .	A forest tree (<i>albizzia lebbek</i>).
Sowcar	. . .	A moneylender.
Sowcari	. . .	Dealings in money and exchange.
Taccavi	. . .	An advance made by Government to cultivators for agricultural purposes.
Tahsil	. . .	A revenue sub-division of a district.
Tahsildar	. . .	A revenue officer in charge of a <i>tahsil</i> .
Talabi	. . .	Land irrigated from tanks.
Talukdar	. . .	A big landowner.
Tum-tum	. . .	A horse or bullock carriage.
Vaid	. . .	A practitioner of one of the Indian systems of medicine.
Zamindar	. . .	A landowner, a peasant proprietor.

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