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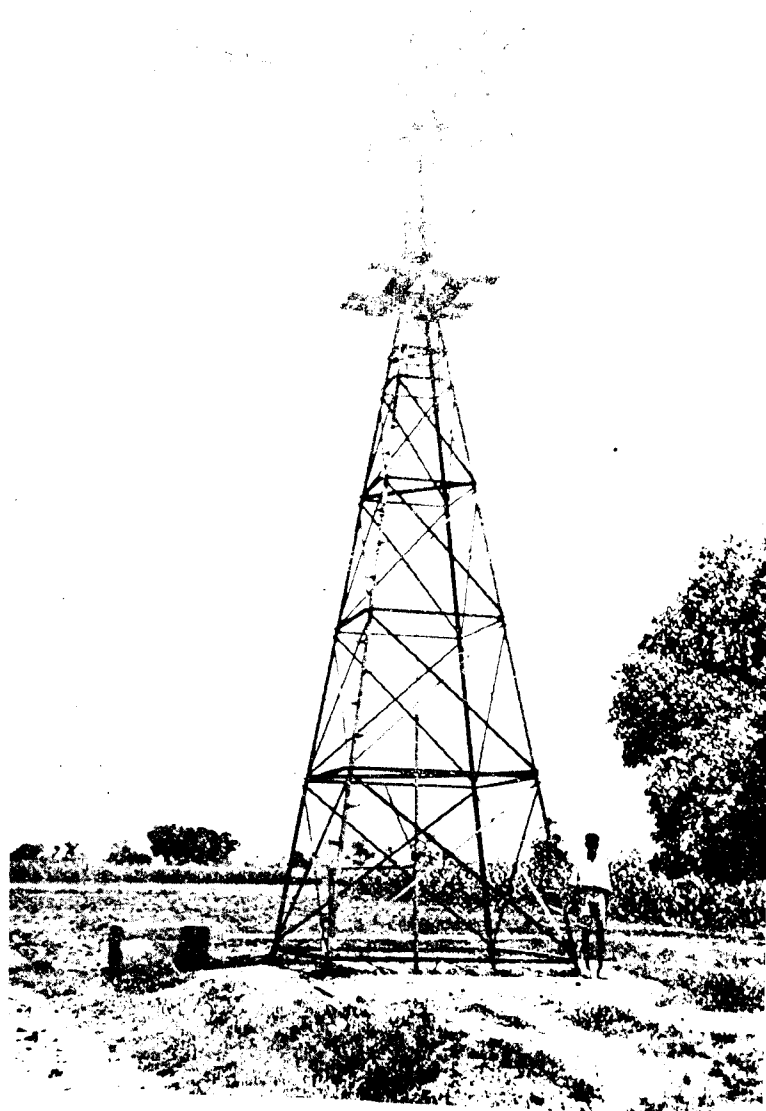
ON THE

OPERATIONS OF THE DEPARTMENT
OF AGRICULTURE

MADRAS PRESIDENCY

FOR THE YEAR

1928-29



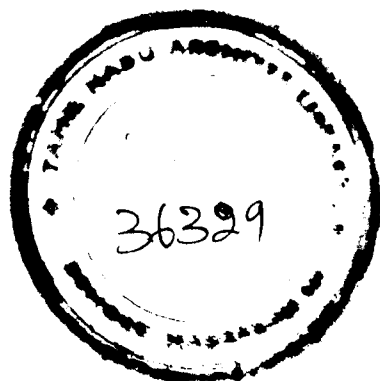
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MADRAS

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1929



CONTENTS.

	PAGE
I. Administration	1
II. Agricultural education	6
III. Season and rainfall	13
IV. Research	15
V. Livestock	45
VI. Demonstration	54
VII. Publications and supply of information	85
VIII. Accounts	88
IX. Statistics	88
X. Programme of work for 1929-30	90

OFFICE OF THE
DIRECTOR OF AGRICULTURE, MADRAS,
Dated 15th August 1929.

R.O.C. No. D. 68 Pdl./29.

From

RUDOLPH D. ANSTEAD, ESQ., C.I.E., M.A.,
DIRECTOR OF AGRICULTURE,
MADRAS,

To

THE SECRETARY TO GOVERNMENT,
DEVELOPMENT DEPARTMENT,
FORT ST. GEORGE, MADRAS.

SIR,

I have the honour to submit the report on the operations of the Department of Agriculture for the year 1928-29.

I.—ADMINISTRATION.

2. I was in charge of the department throughout the year. The year under report has been memorable for several reasons. First of all the Report of the Royal Commission on Agriculture in India was published. Steps were at once organized to take action on this report. A Provincial Agricultural Advisory Committee was formed with His Excellency the Governor as Chairman, the main functions of which are three-fold ; first to examine in detail the recommendations of the Commission which apply directly to the Presidency and to decide what action if any is necessary to put them into force, and when such action is necessary to formulate specific proposals ; secondly to correlate as far as possible the activities of the various departments of Government concerned with schemes affecting the general uplift of the rural classes ; thirdly to place suggestions and schemes before the Imperial Council of Agricultural Research when that body is constituted. Four meetings of the Committee have been held and considerable progress has been made.

3. I was asked by Government to prepare a detailed scheme of reorganization and development of the department and my attention was specifically called to the following defects of the department as it has hitherto existed :—

(1) that so far research, administration, and propaganda have not been sufficiently differentiated,

(2) that as a result research workers have been treated too much as if they were part of the administrative machinery,

(3) that the administrative officers have not yet a clear conception of their administrative functions and that propaganda has been spasmodic and unsatisfactory, and

(4) that the development of the work of the department has not been sufficiently co-ordinated or determined with reference to the relative importance of those problems which come within its scope.

4. In the scheme which I have submitted to Government, which is designed to cover a period of ten years, these defects have been remedied as far as possible and a systematic plan of progressive development has been planned and forecasted showing just how much money will be needed for the purpose and how, should it be found, it will be spent. The recommendations of the Royal Commission have been incorporated into this scheme wherever possible. I am gratified to say that in G.O. No. 2-S (Press), dated the 25th May 1929, Government have approved these proposals generally in principle and in the budget for 1929-30 have provided funds for making a very substantial beginning with the new order of things. I venture to feel that on the eve of my retirement I have been able to leave the department in a position to develop in an orderly and logical way.

5. Our propaganda work has been greatly facilitated by the addition of a travelling motor van unit which can visit the villages with exhibits. This method is better suited to this Presidency than a train which has been tried in other provinces and the van has met with great success.

6. Another feature of the year has been the addition to the staff of a Research Engineer. This officer has

long been desired and we are now in a position to test agricultural implements and to design new ones.

7. During the year I have been able to inspect the District work in the Madura, Tanjore, Chittoor, Coimbatore, Malabar, and Trichinopoly districts besides the work on the Experiment Stations at Taliparamba, Kasaragod, Pilicode, Nileshwar, Anakapalle, and Samalkota, and the Paddy Breeding station at Pattambi. I attended two meetings of the Indian Central Cotton Committee held at Bombay. In March 1929 I went to Bombay to sit on the Committee for the selection of a Physiological Botanist, and from there proceeded to Calcutta to give evidence before the Tariff Board. In January 1929, I attended the Mirasdars' Conference at Aduturai, and I laid the foundation stone of the new Agricultural Middle School at Usilampatti to be opened shortly by the District Board of Madura.

8. The University Commission inspected the Agricultural College in November 1928. Their report is now under consideration.

9. In September 1928, I attended the Conference held at Simla called by His Excellency the Viceroy to consider the recommendations of the Royal Commission on Agriculture.

A.—STAFF.

Indian Agricultural Service.

10. Messrs. G. R. Hilson, Cotton Specialist, and A. C. Edmonds, Deputy Director of Agriculture, I Circle, were on home leave for about ten months during the year.

M.R.Ry. D. Balakrishnamurti Garu, Vice-Principal, Agricultural College, went on long leave for 28 months from 21st May 1928. In his place M.R.Ry. P. H. Rama Reddi Garu, Deputy Director of Agriculture, III Circle, was posted as Officiating Vice-Principal, and the post of the Deputy Director of Agriculture held by the latter was temporarily held in abeyance by the Secretary of State for India.

Mr. Saadat-ul-lah Khan, Deputy Director of Agriculture, VI Circle, went on leave for six months from the 8th March 1929.

The posts of Pulses Specialist nominally held by M.R.Ry. S. Sundararaman Avargal was abolished during the year consequent upon his confirmation as Government Mycologist.

Madras Agricultural Service.

11. *Appointment.*—A new post of Assistant Cotton Specialist was sanctioned during the year, and M.R.Ry. R. Chockalingam Pillai Avargal was appointed on probation to it.

12. *Confirmation.*—M.R.Ry. M. Anandan Avargal, Assistant Paddy Specialist, and M.R.Ry. S. Sitarama Patrudu Garu, Assistant Director of Agriculture, Sugarcane Station, Anakapalle, were confirmed in their respective appointments.

13. *Retirement.*—M.R.Ry. A. V. Thirumuruganatham Pillai Avargal, Assistant Director of Agriculture, went on leave from the 21st February 1929, preparatory to his retirement from service on the 16th April 1929.

14. *Officiating appointments.*—M.R.Ry. T. Bhudavaiya Rao Nayudu Garu, and M.R.Ry. M. Mangesha Rao Avargal, continued to officiate in the Madras Agricultural Service at the end of the year.

Other gazetted appointments.

15. *Research Engineer.*—The post of a Research Engineer on a pay of Rs. 750—50—950 was created during the year, and Mr. N. G. Charley was appointed on a five-year contract with effect from 1st August 1928.

16. *Superintendent, Central Cattle Farm, Hosur.*—Mr. R. C. Woodford, Temporary Superintendent, Central Cattle Farm, Hosur, resigned his appointment with a view to accept the post of Live-Stock Expert under the Assam Government. This vacancy was filled by the appointment of M.R.Ry. T. Murari Garu, on a five-year contract with effect from the 21st January 1929.

Deputation.

17. M.R.Ry. K. Ramayya Avargal, Assistant Paddy Specialist, who had been on deputation in England to specialize in Plant Genetics, returned on the 7th January 1929 after finishing his course of studies.

18. *Non-gazetted executive staff.*—The number of upper subordinates in the Agricultural and Science sections was increased during the year by 15 and 3, respectively, the sanctioned strength on the 31st March 1929 being 81 in the Science section and 162 in the Agricultural section.

The vacancies occurring during the year were filled as far as possible. There were, however, six vacancies in the Agricultural section and one in the Science section at the end of the year, one in each of which has been subsequently filled up.

B.—BUILDINGS, ETC.

19. Besides the routine minor works and annual repairs, the following works were undertaken departmentally and executed during the year :—

(1) A cattle shed, sugarcane furnace, and a well at the sugarcane station at Anakapalle.

(2) Two implement rooms, two irrigation spouts, fencing, laying pipes at Samalkota.

(3) A pakka threshing floor, and three sheds for accommodating a cotton assistant, and two plant collectors at Guntūr.

(4) A manure pit at Hagari.

(5) An Assistant Farm Manager's quarters and a coolie hut at Nileshwar.

(6) Fencing at the Potato Farm, Nanjanad.

(7) Quarters for a farm clerk and a storekeeper and two wells at the Paddy Breeding Station, Aduturai.

(8) An implement shed, metalling round buildings and fixing of irrigation and drainage pipes at the Paddy Breeding Station, Maruteru.

(9) A seed store, revetment of main channel, wire fencing, two threshing floors, combined cartstand and implement shed, and manure pit at the Paddy Breeding Station, Pattambi.

(10) A cattle-shed and cattle food room and threshing floor at the Cotton Breeding Station, Coimbatore.

(11) A laboratory at the Cotton Breeding Station, Koilpatti.

(12) A seed store, a cartstand and quarters for two plant collectors at the Millets Breeding Station, Coimbatore.

(13) Cattle dip, a cattle trevis, two feeding troughs and one drinking trough at the Central Cattle Farm, Hosur.

(14) A new road and two silo pits at the Ongole Cattle Farm, Chintaladevi.

(15) An elementary school, an office for the Deputy Director of Agriculture, VIII Circle, an insectary, a dressing shed for animals, fitting up a disintegrator, two masonry channels on the College estate.

The dairy milking shed estimated to cost over Rs. 10,000 which had been making slow progress in the previous year was almost completed during the year under report.

20. Good progress was made by the Public Works Department with regard to the construction of 8 "C" and 8 "D" type quarters at the Agricultural College estate, Coimbatore, the construction of a combined office and store and the extension of implement shed at Guntūr and the several buildings for the Agricultural Middle School, Kalahasti.

21. The Public Works Department carried out the following works and completed them during the year.

(1) The laboratory, jaggery shed, seed and manure depot building and the cattle and implement shed at the Sugarcane Testing Station, Anakapalle.

(2) A masonry channel and a kitchen for Indian Officers at Samalkota.

(3) A summer house at the Sim's Park, Coonoor.

The drainage scheme of the Agricultural College estate at Coimbatore sanctioned by Government was begun under the supervision of the Public Works Department.

II.—AGRICULTURAL EDUCATION.

22. The Agricultural College at Coimbatore is affiliated with the Madras University and teaches a degree course. Last year the teaching was separated from the research, the former being carried on in the Freeman Buildings which were completed in 1927 and the latter in the old buildings which have now become a Research Institute. Under this arrangement the Principal was made responsible for all the teaching work and the upkeep and management of the Central Farm and College Estate, the staff concerned being

placed directly under him. This system has been still further expanded and developed during the year under review, the Assistant Agricultural Engineer being added to the Principal's staff, and all repairs and upkeep of the estate being placed under the Principal. In addition to this, the centralization of stores and stationery has been completed under the Principal.

23. The Principal M.R.Ry. C. Tadulinga Mudaliyar Avargal is to be heartily congratulated on the way in which he has carried out all these changes without a hitch and on the smooth running of the College and Estate. Though he has a Vice-Principal to help him, he has undoubtedly been hard pressed, more especially as he has doubled his duties with those of the Systematic Botanist. In the re-organization scheme which has been accepted by Government it has been realized that the Principal must receive more help, and he will in the coming year be given a gazetted officer as a Personal Assistant, and the scheme of centralization will be completed by centralizing all the clerks in the Principal's office.

24. The separation of teaching from research does not find approval with everybody and the Royal Commission on Agriculture in India did not altogether approve of it. In their report they said, "No hard-and-fast rule can be laid down as to the extent to which research workers should undertake teaching, or as to the time which the teacher should devote to research." The impossibility of making rules has been recognized at the Agricultural College, but the students are given facilities for seeing what is going on in the Research Institute and the research officers deliver a certain number of lectures on their special subjects voluntarily. The teachers are also given facilities for carrying on research if they desire to do so.

25. That this system is working satisfactorily may be judged from the fact that the following lectures, covering a very wide range, were delivered to students by research officers during the year :—

Five lectures on plant breeding and allied subjects by the Paddy Specialist, the Cotton Specialist, the Millets Specialist and Mr. N. Dutt ; a lecture on Bacteriology by the Bacteriological Assistant ; a lecture on Hydrogenion concentration by the Assistant

Chemist ; one on Animal Nutrition by the officer in charge of that section ; three lectures on enzymes and malting, base exchange, and manures, by the Government Agricultural Chemist and his staff ; a lecture on the biological control of insects by the Government Entomologist ; and one on the control of plant diseases by the Government Mycologist. Finally a lecture on the interpretation of results was given by the Agricultural Chemist and four lectures on Revenue Settlement by the Statistical Assistant.

Some members of the teaching staff carried out some research and presented the results to the Indian Science Congress and the Pusa Publication Board.

Classes II and III went on instructional tours as usual.

26. A special University Inspection Commission paid a visit to the College in November and their report has recently been received. It is very satisfactory and no great changes are recommended. The Vice-Chancellor with several members of the University Commission also paid a visit to the College during the year.

27. The selection of students for Class I was made for the second year in succession by a Committee consisting of the Director of Agriculture, the Principal, and three non-official members M.R.Ry. Rao Bahadur T. A. Ramalingam Chettiyar Avargal, Rao Sahib V. Krishna Menon Avargal, and Mr. Kader Moideen Sahib Bahadur, M.L.C. Three hundred and seven applications were received, but only 241 students presented themselves for an interview. Forty-one were selected, 20 from Tamil districts, 7 from the Circars, 7 from the Ceded districts, Guntūr and Nellore, and 7 from the West Coast. The number of students on the rolls during the year was

	Class I.	Class II.	Class III.	Total.
Beginning	41	40	42	123
End	39	40	42	121

28. *Scholarships.*—The scholarships of Rs. 25 per mensem granted in previous years were continued, and the following were granted during 1928 :—

(1) A scholarship to the best student of B.Sc. Ag. Class I won as the result of examination.—T. Nataraj.

(2) Two scholarships to deserving students from the Agricultural community—K. M. Narasimhan and S. Krishnamurthi.

(3) A scholarship for a member of the Depressed Classes—Krupadanam.

(4) A scholarship for a member of the Muhammadan Community—Syed Muhammad.

In addition to these, one of the vacant scholarships was granted to R. Kolandaiswami Nayakar—a member of the Kallar community.

Again the Selection Committee have to express their disappointment at the very small numbers of the Depressed Classes and Muhammadans who presented themselves.

29. The results of the B.Sc. Ag. examinations held in 1928 were as follows—Forty-three students appeared for Part I, of whom 38 passed. Twenty-seven appeared for Part II, of whom 19 passed and qualified for the degree.

30. *College Day.*—The Annual College Day and Agricultural Conference were celebrated under the auspices of the Madras Agricultural Students' Union from 7th to 14th July. His Excellency the Rt. Hon'ble the Viscount Goschen, the Governor of Madras, did us the great honour to preside over the opening of the Conference and Her Excellency graciously presented the medals and prizes won by students in the College and University examinations.

31. As pointed out in my Administration Report last year, this annual gathering brings together old boys and friends both within and without the department and it serves to keep warm the love of their *alma mater* in the hearts of our students, and, combined with college sports and social gatherings as well as a conference at which papers are read by the junior members of the staff who are thus enabled to try their wings and at which the general public have a chance of which they often take advantage of criticism, it is a power for good. His Excellency in his presidential address spoke very highly of the benefits to be obtained from such gatherings, and the Royal Commission on Agriculture in India have also expressed their opinion that such meetings should be held more frequently.

32. Last year, the function was much crippled and restricted in scope, because objection was taken to it apparently on grounds of expense. The function has been held ever since 1907 and this is the first time such objection has been raised. I can only once more express a hope that Government may be persuaded to reconsider the restrictions which they have imposed and in the light of the opinion expressed by His Excellency and the Royal Commission restore our facilities for throwing this annual conference open to as many members of the department and visitors as possible.

33. *The Students' Club.*—I am gratified to be able to report that a much greater interest was shown in games at the College during the year and that we were successful in winning four trophies, two for foot-ball, one for athletics, and one for badminton. The cricket team also played a large number of matches and did well. With increased number of students more facilities for games are needed both in the way of playing fields, tennis courts, and Government grant in aid.

34. *Library.*—The Agricultural College Library is at present under the Principal. In former years the post of Librarian was considered of such importance that it carried an allowance of Rs. 100 per mensem, but this was swept away in the flood tide of retrenchment experienced some years ago. The necessity for such a post in a big scientific library must be obvious. A subject index of periodic literature has never hitherto been attempted, and even the cataloguing of books by subjects has fallen in arrears. In view of the increased number of officers who will utilize the library within the next five years, and in view of the large number of students now in residence the need for a well run, catalogued, and indexed library is obvious. It is useless to accumulate literature on the many subjects included under the head of "Agriculture" unless such information is readily available.

35. It is, therefore, proposed to revive the post of Librarian during the coming year and to fill it in the first place by a member of the upper subordinate service, and I am happy to say that Government have sanctioned this proposal. It will be necessary very soon to face the fact that more space will have to be found

for this library, which is rapidly becoming a valuable collection of books and periodicals dealing with specialized subjects such as exists nowhere else in the Presidency.

36. *Agricultural middle schools.*—Only one middle school continued to function during the year, that at Taliparamba, where the year closed with forty-four boys on the rolls. In the final examination which was held by the District Educational Officer, Malabar, and the Deputy Director of Agriculture, VII Circle, of thirty boys examined seventeen were declared to have passed and to be eligible for certificates. Those who failed mostly did so in the non-technical subjects. Ninety boys have now passed through this school and 70 per cent of them are said to be actually engaged in either farming or teaching nature study in schools. A good practical course in agriculture is taught at this school which not only includes the common crops of the locality, but also the dry cultivation of coconuts, the use of rotation crops on dry land, the making and use of silage and artificial cattle manure, poultry farming, and an elementary course in dairying. The students when they leave have been given a useful training in practical farming.

37. Largely owing to the energy of Mr. R. Foulkes, the President, the Madura District Board have decided to open an agricultural middle school for the benefit of the Kallars at Usilampatti. There is already an excellent high school there and an enthusiastic troop of boy scouts and this school will form an adjunct to this, a certain number of boys being drafted each year to the agricultural school to get two years' training in practical farming before they go on to their land. In a controlled area like the *Kallarnad* such a school is bound to be a success and it gave me the greatest pleasure to be able to lay the foundation stone in January. The Government have contributed a substantial grant towards the erection of the buildings and the Agricultural Department will find the technical teacher and the manager for the school farm, but the bulk of the cost will fall on the Board.

38. Plans and estimates for a school have been drawn up for the Tanjore District Board and a suitable site has been selected, but there the matter appears to have ended. These plans were made nearly two years

ago, but nothing further has been done to bring the school actually into being.

39. *Rural education.*—A new building to house the elementary school at the Agricultural College was erected during the year. The classes for juvenile and adult labourers at the Central Farm, Coimbatore, and the Agricultural stations at Palur and Anakapalle were held during the year as usual.

At Coimbatore, the strength at the end of the year was 10 boys for the day and 12 for the night classes.

40. At the Palur Experiment station, the school contained this year the highest number of boys ever on the rolls, 27. A Taluk Elementary Board School has now been opened and this has attracted a number of the pupils, but at the close of the year the strength was 15. The night school was not well attended and there are only 10 on the rolls.

41. At Anakapalle the average number of pupils on the roll during the year was 36. The total expenditure on the maintenance of these schools during 1928-29 was Rs. 1,984.

42. As remarked in former reports the cost of these schools is no doubt on the high side since the attendance is so small, but they have a value of their own because the children catered for would probably receive no education at all did they not come to these schools. Here they learn familiarity with improved methods of agriculture which they see going on at the experiment stations, the use of improved implements, and a certain amount of discipline, and they are capable by the time they leave of reading departmental publications in the vernacular. This must help to fit them to become better labourers and citizens. These schools do not aim high, but they play a useful, if modest, part in the very difficult problem of agricultural education in the country and are worth the money spent on them.

43. *Agriculture in elementary schools.*—I continued to preside over a committee appointed by the Director of Public Instruction to examine the possibility of introducing agriculture into the curriculum of the secondary and middle schools in the Presidency on the lines adopted in the Punjab. The Committee

have now reached the end of their deliberations, and their final report will be presented at an early date, and may here be anticipated by saying that what is needed is the regular teaching in these schools of nature study rather than of agriculture, which is a highly technical subject unsuited to schools. Some system should be adopted by which a knowledge of the simple processes of nature are instilled into the minds of children and this should then pave the way to the teaching of other subjects later of which agriculture might be one. It is quite impossible to teach agriculture in such a way that it will be of any value in after-life in anything but a technical school equipped with a model farm run to pay. Such farms cannot be easily attached to a school, nor can the schoolmasters have the necessary knowledge and skill to run them.

What the school needs is a garden. The great difficulty at present is the lack of teachers who know anything about nature study. Courses will have to be opened for the training of the necessary teachers at the teachers' training centres which must be equipped with good gardens for the purpose.

44. Personally, I am greatly interested in this subject and I am an advocate for the teaching of nature study in all our schools. As far as the Agricultural Department is concerned, their task would be made much lighter if they had a ryot population to deal with who could not only read and write but had mastered the elementary facts relating to natural laws.

III.—SEASON AND RAINFALL.

45. The south-west monsoon commenced on the West Coast on the 3rd June and gave fairly heavy rainfall till the end of August with breaks now and then. The rainfall was up to the average in the Circars, Deccan (Cuddapah excepted) and North Arcot, above average in the Carnatic, and seriously in defect in the Central districts (North Arcot excepted) and the South.

46. The north-east monsoon commenced feebly on the 16th October, became vigorous on the 20th, and brought copious rain throughout the Presidency till

the 27th. A depression formed off the Coromandel Coast on the 20th. It developed into a storm on the 21st and moving north-westwards, crossed the coast near Masulipatam on the 22nd. Torrential rains fell for three days over an area extending from Vizagapatam to Cocanada, causing severe floods and extensive damage to houses, roads, railways, and irrigation works. The monsoon practically came to a close thereafter in the Circars and Deccan. Heavy rains were received in November in South Arcot and the South. In December, the monsoon was intermittently active on the Coromandel coast till the 8th. A prolonged spell of dry weather then set in and continued till the 23rd when the activity of the monsoon was stimulated by a Bay storm which disappeared off the Coromandel coast on the 25th after causing widespread rain along the coast and local rain in the Central districts between the 24th and 29th. On the whole, the north-east monsoon was up to or above the average in most districts outside the Deccan and Malabar.

47. The effect of the season on the crops at the Agricultural Stations and on the work of demonstrating agricultural improvements in the districts is described below :—

At Anakapalle, floods reduced the yield of paddy and damaged some of the experimental plots. At Samalkota, heavy rains accompanied by winds reduced the yield of paddy. At Guntūr, cotton gave a good yield; tobacco and maize suffered from severe drought and chillies suffered from a severe attack of "thrips". At Hagari, jonna and *korra* suffered for want of rain and bengal-gram was attacked by caterpillars. At Nandyal, the yield of most crops was low. At Palur, the season was favourable for most crops, especially for paddy. At Palakuppam, all crops gave good yields. At Koilpatti, the season was unfavourable to cotton owing to the untimely rainfall in February but it was favourable to cereals. At Taliparamba, the yield of paddy was satisfactory, but the yield of pepper was very low owing to "Pollu" attack and the shedding of spikes. The season was good for coconuts on the West Coast stations. At Coimbatore, crops suffered generally from insufficient and ill-distributed rainfall.

At Nanjanad, the scanty rains in May and dry spells during the south-west monsoon were detrimental to the main crop of potatoes, but the second crop was benefited by the favourable north-east monsoon.

48. The season aided progress in the demonstration of agricultural improvements in I, IV, and V Circles. The demonstration plots gave fair profits in Kistna and Guntūr but the results were not appreciable in Nellore. Paddy demonstration plots did not give satisfactory results in parts of South Malabar owing to the insufficient rainfall of the north-east monsoon.

IV.—RESEARCH

49. The research work carried on by the department is of two kinds; that done by the specialists at Coimbatore, where they are equipped with laboratories and special stations, and that done on the Agricultural Experiment Stations in the districts. This work is interdependent. The fundamental problems underlying the practice of agriculture in this country, of crop pests and diseases, and of the improvement of existing crops by plant breeding methods are studied at Coimbatore by a number of experts. Their discoveries are tested out under local conditions on the experiment stations in the districts.

50. This arrangement is necessary because it is essential that any new method should be proved on a field scale before it can be demonstrated to the ryots. A new strain of paddy, which does very well at Coimbatore for instance, may not do equally well in the Tanjore delta, and it is necessary to try it in the latter place on a field scale before it is given out to the ryots as an improved variety.

51. The agricultural experiment stations are used, therefore, to test improved strains made originally at Coimbatore, to compare them with one another and with local varieties, to test manures of various kinds on different crops under different conditions of spacing, and so on. A good deal of miscellaneous experimental work is also carried out on these stations. Whenever any question arises which is amenable to direct field experiment, more especially local problems.

the stations are naturally looked to as suitable places on which to conduct such experiments.

52. Results obtained on these experiment stations, once they have been proved, are demonstrated to the ryots by means to be described later in this report. There are now 31 such stations in the Presidency, some of them designed for the purpose of studying general farming problems, and some, like the Paddy Breeding station at Aduturai, the Potato station at Nanjanad, and the coconut stations on the West Coast, entirely devoted to the study of one particular crop.

53. Such experiment stations, with their expert staff, are absolutely necessary, and all attempts at demonstration must be preceded by careful research on them. The problem of making the results of the research carried out on such stations known to the cultivators is one attended with many difficulties, and it is dealt with under the heading of "demonstration" in section VI of this report.

A.—CROPS.

(a) *Paddy.*

54. Paddy is by far the most important crop in this Presidency. It is the staple food of the majority of the population and during the year under review it occupied 10,929,615 acres. For this reason, plant breeding work from the very beginning was concentrated on this crop. We have now four breeding stations devoted entirely to paddy, a main station at Coimbatore which is the headquarters of the Paddy Specialist, and sub-stations at Aduturai, Maruteru, and Pattambi, each in charge of a Gazetted Assistant. The last station is our latest acquisition and though it was started last year it was formally opened by His Excellency the Governor this year.

55. The work done on these stations is of two kinds; economic, the multiplication and trial of improved strains produced by selection, combined with manurial and cultural experiments; and academic, the study of the mechanism of inheritance of character along Mendelian lines. This latter work will lead in time to the production of entirely new strains

by methods of hybridization, and such new strains may carry high resistance to disease among other desirable characters.

56. The need for the duplication of these stations is not always understood by the public. The Royal Commission in their report say "The Agricultural departments of India are now so well aware of the disappointments which may ensue unless an improved variety is thoroughly tested in the conditions under which it would be grown by the cultivator before it is given out on a field scale that it is unnecessary to stress the importance of such tests. We are of the opinion, however, that tests of new varieties carried out on holdings typical of those in the tracts for which the varieties are deemed suitable would be of much value."

57. In a Presidency as large as Madras with its varying conditions of soil and climate it is very difficult to arrange for this. The four stations mentioned above cover the main paddy-growing areas as completely as possible, and strains evolved on them will probably suit general conditions in their neighbourhood, but before these are issued to the ryots with any confidence it is often necessary to test them again on the district experiment stations to avoid disappointment, and in districts where such stations do not yet exist it is difficult to give exact advice to the ryots. At present, we have not got too many stations, but too few for our real needs. A new strain evolved say on the Aduturai Station will not necessarily suit all areas in the Tanjore Delta. We can only hope to evolve general improved types likely to suit certain areas, but before we are quite sure these should be rigorously tested out in that area itself. As far as possible with our present limited organization this is done.

58. It is difficult for the layman to understand the exact nature of the work which is done on these breeding stations and all the intricate details which involve infinite patience on the part of the research officers concerned. We, at all times, welcome visitors to whom the work is explained as far as possible. I am happy to say that more and more ryots and others visit the stations each year and the work being done on them is beginning to be not only understood but

very much appreciated. I commend the lucid report of his work presented by Mr. R. O. Hiffe and his reports on the Paddy-breeding stations in which the details of his work and the objects which he has in view are very clearly set forth. These reports must be perused by themselves as it is impossible for me to do them justice in this report even had I the technical knowledge to do so.

59. There can be no doubt whatever as to the value of this work, and that it is appreciated by the ryots is shown by the huge demand for seed of the new strains. This is indicated by the following figures which show the amount of seed issued to district officers for distribution to the ryots from these stations :—

Station.						Seed issued.
						LB.
Coimbatore	...	...	...	...	...	27,488
Aduturai	...	...	...	...	...	51,575
Maruteru	...	...	...	...	...	41,690
Pattambi	...	...	...	...	...	18,850

If the utmost advantage were taken of this seed and the reduced seed-rate advocated by the department was universally used, it would be sufficient to transplant 6,980 acres.

60. A perusal of Mr. Hiffe's reports will show the many lines of research which are being undertaken and the many problems which still remain to be tackled. I have selected a few of these for mention in this report.

61. Unfortunately the season this year, especially at Coimbatore where there was an abnormal shortage of water never before experienced in the history of the station, rendered much of our work abortive, and no conclusions could be reached. The crop on the neighbouring ryots' fields failed entirely in many cases and was replaced by cotton. It is, however, worthy of notice that despite this the flat yield was 2,800 lb. of grain per acre, and this was partially due to the system of cultivation adopted. The fields which have for years received no manure mixture were this year, as luck would have it, dressed with finely chopped green leaf, and the soil was thereby enabled to retain its moisture longer and it produced a good crop despite the drought.

Incidentally this drives home the great benefits of green manuring and the value of organic matter in any manurial system on South Indian soils and our neighbours the ryots must have been greatly impressed.

62. *Economic work, Coimbatore.*—Eight improved strains have now been released from this station and these have all found favour with the ryots. As mentioned last year, the effect of sowing at different seasons has been under investigations since 1924 and it is now finished and the results are being incorporated in a bulletin. The results of sowing at different seasons are rather divergent but, on the whole, the advantages of sowing at the right time are well indicated.

Manurial trials have again shown that on the Coimbatore soils the largest financial gain is obtained by applying green leaf alone and that it does not pay to replace it or supplement it with nitrate of soda.

Other important investigations which are being carried on deal with the study of the root system of paddy, and a study of the causes of lodging. The results so far obtained in both these investigations are being written up in the form of bulletins.

63. It was mentioned last year that an important study of the histology of paddy had been begun.

The improvement in yield is not all that should be considered in dealing with this crop, something should also be known about its food value, more especially as for millions of people it constitutes the whole of their diet. It is, therefore, of the greatest importance that the plant breeder should consider the possibility of putting the maximum amount of food value into his new selections and the various processes of preparation such as pounding, milling, and boiling evidently bear upon this problem. Considerable progress has been made with this investigation. A satisfactory method of technique has been worked out by which sections fit for photo-micrography can be prepared, hitherto a difficulty, and the study of the effect of par-boiling has been advanced. It is the general opinion that boiled rice is more sustaining than raw rice. The first effect of par-boiling is to cause an extrusion of the embryo through the micropyle and future pounding breaks off this embryo which may be

lost. If there is, as is supposed, a concentration of vitamin in the embryo such loss will detract from the food value of the pounded and par-boiled rice. The final polishing makes little difference, but in the case of raw rice losses by polishing are significant. Fortunately the vitamin is not confined to the embryo and so the loss may be made up in the extra amount of bran which is retained in polished boiled rice as compared with polished raw rice. The investigation is by no means complete, but the above will indicate its great interest and importance.

64. *Academic work.*—On all these stations work is being done on inheritance characters, and hybridization is undertaken. It is difficult to explain this work to the layman, but the investigation which is in progress on the possibility of evolving a strain resistant to *piricularia* disease, the familiar *blast* disease of paddy, may serve to illustrate its importance. *Korangsamba*, a popular strain which is, however, subject to this disease has been crossed with G.E.B. 24 which is highly resistant to it. This cross produced a number of variations and the types favouring the immune parents retained their immunity. It remains to be seen how far the immunity has been transferred to the susceptible plants. Other inheritance studies aim at producing resistance to salinity, improving the size of the grain for *kuruvai*, the elimination of shedding in Co. 2, the reduction in the size of the grain of Adt. 5 without reducing the yield, and so on.

65. *Economic work, Aduturai.*—In addition to the work on strains, which is of a more or less routine nature, a number of investigations are being carried out on this station with regard to cultural and manurial treatment of the crop. Ryots habitually save seed from the main *samba* crop but not from the *thaladi* or nursery crops. Experiments have shown that it does not apparently matter from which crops seed is saved and that the prejudice against seed from the *thaladi* or nursery crops is not supported by actual fact. Manurial trials have again shown that on these delta soils, it is best to use green leaf alone to supply the requisite nitrogen and that though a small supplement of nitrate of soda may be economical a further increase of nitrate nitrogen is not profitable, nor can this

artificial manure replace or supplement village cattle manure. A trial of synthetic farm yard manure prepared from hedge clippings, weeds, etc., showed that it was equivalent in value to the best cattle manure prepared by the loose box method, a very significant and important result.

66. *Economic work, Maruteru.*—At this station, which is comparatively new, mass and pure line selection work bulks large in the programme and though there has not yet been time to isolate any important types satisfactory progress in this direction is being made. The system of sowing a mixed crop of early and late varieties, known locally as *Udu*, is under special study with a view to discover the best pure types to use for this purpose. Arising out of this is the question of the effect of topping since the late variety is cut over when the earlier one is harvested. Experiments show that the later the cutting the greater the damage. The possibility of growing two crops in the main season is also under investigation, the idea being to plant an early variety in June which can be taken off in September and to follow it by a late variety from a thinly sown July sowing. The results of this are encouraging and if successful this system would utilize water more economically than the present system of single cropping. A systematic study of green manures suitable for the delta is being made and also of the best methods of storing seed.

67. *Economic work, Pattambi.*—This is a new station and the economic work is almost entirely devoted to the examination and purification of local mixtures with the aim of selecting and testing pure types. The need for this station was at once shown, as none of the Coimbatore or Aduturai strains proved of value for the first crop season, though some of the former will be useful for second crop. An interesting part of the work at this station is that being carried out with *modan*, or dry paddy, an entirely new field of investigation.

We are now in a position to give to the ryots mass selected bulk seed of the most important varieties of Walluvanad taluk and 18,850 lb. were stored for this purpose during the year.

(b) *Cotton.*

38. Mr. G. R. Hilson, the Cotton Specialist, was on home leave for the greater part of the year and Mr. R. C. Broadfoot, Deputy Director of Agriculture, was in charge. The main work of the section is to produce better strains of cotton suited to different localities both by means of selection and hybridization, the work therefore being both economic and academic. Both irrigated and rainfed cottons are dealt with.

69. The season at Coimbatore was favourable for irrigated cottons, less favourable for rainfed cottons, and distinctly unfavourable for cereals and pulses grown in rotation with cotton.

70. *Economic work, Cambodia.*—It is very satisfactory to be able to report that Cambodia strain No. 440, now re-named Co. 2, continued to do well. There seems to be no reason why this strain with fair but not special treatment should not give an average yield of 1,000 lb. of *kapas* per acre for the season's pickings alone.

71. *Rainfed cotton.*—Three strains of *upham* cotton have been isolated which show a distinct improvement over the local *upham* in respect of quality and one of these gives an equally good yield and has at the same time a higher ginning percentage. None of these strains, however, are as good as *Karunganni* in respect of quality.

72. *Time of sowing.*—The experiments reported last year were continued and again gave a result distinctly in favour of the earlier sowing. It would appear, however, that yield does not depend on the actual time of sowing but rather on the length of the interval between the date of sowing and the incidence and strength of the north-west monsoon rains. Early sowing has the advantage that pickings begin earlier and relieves the cultivator of the necessity for irrigation at a time when water is apt to run short. An investigation into the water requirements of this crop indicates that it will be difficult to give a lighter irrigation than two acre inches.

73. *Academic work.*—The most promising hybrid, *Indicum* × *Roseum* No. 65 is a selection from a cross between N. 14 and G.N. *roseum*. The quality of this

hybrid is distinctly better than that of *Karunganni* but its yield still needs study.

74. The Koilpatti Experiment Station has now been converted into a cotton breeding sub-station. The motive behind the work on this and other stations covers a wider field than plant breeding however.

An economic problem of the greatest importance to the ryots is being attacked, viz., the relation between the need for the production of good cattle manure and good cows' milk and the production of crops. For the production of good cattle manure a supply of straw of cereal crops for litter is necessary and for the production of milk better feeding of the cows is essential. The problem can be attacked both directly and indirectly, directly by improving the yield of the cereals by better manuring, and indirectly by increasing the yield of the cotton so that the same return can be obtained from a smaller area so that the area under cereals and fodder can be increased which will enable the stock to be better fed. The ultimate aim is to show the cultivator how to maintain the maximum number of cattle and to obtain the maximum yield from his land. Progress has been made with a number of experiments devised to discover improved methods of cultivation and manuring but the results are not yet conclusive.

75. Somewhat similar work is being done on the Experiment Stations at Nandyal and Hagari. At Nandyal the main work is the isolation and testing of pure strains of cotton and *jonna*, the two important crops of the locality. No strain of cotton has yet been obtained superior to N. 14 which has now been distributed to the ryots.

76. *Work on herbaceous cotton.*—A research scheme dealing with *herbaceous* cotton is being carried out, with financial help from the Indian Central Cotton Committee. The idea is to isolate pure lines of the different strains which form the mixture known as *upham*, to test these strains in the field and mill to determine whether any of them are superior to the mixture in quality or yield, and finally to cross them with one another, or with other species, and thus isolate a strain which will constitute a further improvement. There are about 800,000 acres of rain-fed cotton

in the southern districts of the Presidency. The ryot is of the opinion that in good years *Karunganni* is a better yielder than *upparam* while in bad years the position is reversed. As the season is a gamble, he either sows these crops alternately hoping to hit off the right one, or he grows a mixed crop and with the strains at present at our command we cannot alter the situation. As the *Karunganni* strains now being distributed yield a product capable of being spun to 26s. standard warp, and as the *upparam* local mixture can only be spun to 14s., it follows that anything which can be done to level up the difference must be of great value. If, in fact, a series of strains respectively suitable to the different conditions existing in different tracts could be evolved each producing lint of about the same quality capable say of being spun to 30s. standard warp, and each capable in their own tract of yielding as well as *Karunganni* in good seasons or as *upparam* in bad, we should be in a position to deal with the situation.

We have now isolated a number of strains which are pure and some of these have been tested for yield and quality with promising results.

77. *Transport Act.*—The Cotton Transport Act of 1923 put into effect in 1925 in the Madras Presidency, continued to be in force during the year. There were three protected areas up to 19th September 1928, viz., (1) The Tiruppur-Cambodia area, (2) the Tinnevely area, and (3) the Northern and Westerns area. In view, however, of the strong opposition of the trade, Government combined the first two areas into a single area during the year under report and included therein the eleven districts of Chingleput, South Arcot, Chittoor, North Arcot, Salem, Coimbatore, Trichinopoly, Tanjore, Madura, Rāmnād, and Tinnevely. There was no change in the Northern and Westerns area. Under the new arrangement, the movement of cotton seed was permitted free without licence, but the restriction as regards *kapas* and lint was continued. The revised notification and rules came into force from 19th September 1928. The forms were amended so as to allow issue of exporters' licence for export to any port in India which was not in a protected area. The licensing authority was permitted to fix the period for which single licence could be issued. A note was published in the

newspapers giving wide publicity to the revised notification and rules. Government were of opinion that the question of the control of road transport should stand over for consideration until sufficient experience had been gained of the working of the new protected areas and a study of the possible "gaps in the fence."

78. *Licences under the Cotton Transport Act—Single licences for the import of cotton by rail.*—One thousand seven hundred and two licences mainly relating to cotton seed were issued up to the end of September 1928, when all restrictions on the movement of cotton seed were removed.

Annual licences for import of cotton by rail.—The table below gives information about the licences issued from February 1928 to January 1929.

Cotton year 1928-29 (licences which lapsed on 1st February 1929).

Name of protected area.	Kind of cotton.	Purpose for which licences were issued.	Number of licences issued.	Number of certified copies issued.	Number of certified copies issued.
(1)	(2)	(3)	(4)	(5)	(6)
Tinnevely area ...	Ginned cotton.	Mill consumption.	7	474	393
Do. ...	Do.	Export to ports.	6	127	49
Do. ...	Cambodia <i>kapas</i> .	Mill consumption.	6	60	29
Do. ...	Do.	Export to ports.	2	25	20
Tiruppur cambodia area.	Ginned cotton.	Mill consumption.	6	170	117
	Cambodia <i>kapas</i> .	Do.	1	5	Nil.

Information about licences issued from 1st February 1929 to 31st March 1929 is given below :—

Cotton year 1929-30 (licences which will expire on 1st February 1930).

Name of protected area.	Kind of cotton.	Purpose for which licences were issued.	Number of licences issued.	Number of certified copies issued.
(1)	(2)	(3)	(4)	(5)
Southern area ...	Ginned cotton.	Mill consumption.	5	72

Import of cotton by sea.—One hundred and two licences were issued during the year for the import of ginned cotton and cotton seed into Tuticorin by sea. Of these, fourteen related to ginned cotton and the rest to cotton seed. 6,141 bales of ginned cotton were imported from Karachi and 1,073 bales from Bombay. Messrs. A. & F. Harvey were the chief importers.

79. *Cotton Ginning and Pressing Factories Act.*—This Act continued to be in force during the year. Reports on the inspection of cotton ginning and pressing factories were received from Inspectors of Factories and gazetted officers of the Agricultural Department in charge of circles and action was taken to remedy any defects noticed. The owners of two factories were fined on prosecution for failure to maintain the ginning registers in the prescribed form and to provide the beam scales used in their factories with iron platforms suspended by means of chains.

80. *Weights.*—The limits of permissible errors in weights prescribed by the Board of Revenue were based on the authority of the British Board of Trade Regulations. They appeared to be very narrow for a bulky article like cotton. The Bombay Government also had the British Board of Trade Regulations in view, but the limits of error were made broader on the advice of the Indian Central Cotton Committee which considered that a larger tolerance than was allowed in England was necessary in India. The Provincial Cotton Committee considered this matter at their meeting held on the 5th February 1929 and agreed that the maximum error allowed in Bombay might be adopted in Madras. This question is under consideration in connexion with the proposed revision of Rules 8 and 9 of the Madras Cotton Ginning and Pressing Factories Rules, 1925, relating to weights and scales on the lines of the Bombay Rules.

81. The question as to how far the pools of cotton ginning and pressing factories, wherever they are in existence, are detrimental to the interests of agriculturists was investigated at the instance of the Secretary, Indian Central Cotton Committee, Bombay, and a report on the subject was submitted to Government.

82. One thousand two hundred and eighty forms of ginning register (398 Tamil and 882 Telugu), 30 forms (Telugu) of the pressing register, and 3,227 forms of the pressing return (1,282 Tamil and 1,945 Telugu) were sold to the owners of factories during the year.

(c) *Sugarcane.*

83. Work on the Anakapalle Sugarcane Experiment Station was largely vitiated by a disastrous flood in October. The embankment of the Sarada river breached and the station was flooded for two days. Not only did these floods damage the standing crops but they loaded the canes with silt so that from a research point of view, no figures obtained this year are reliable. This is disappointing, but of course unavoidable.

84. One of the most interesting experiments being undertaken on this station is connected with the amount of water necessary to raise cane. The quantity used by the ryots is much in excess of requirements and this leads to insufficient tillage and a big vegetable growth of the canes. Moreover, excessive use of water has the effect of restricting the time at which the crop is cultivated to periods when water is obtainable most easily and this means late planting. On the station three varieties of cane have been planted in two series in February and April and only one irrigation given, and that at half the usual rate. Preparatory to its application, the soil was cultivated deeply. The yield of the early planted crop was better than that of the later planted one and well above the average.

(d) *Dry grains.*

85. The Millets Breeding Station in charge of M.R.Ry. G. N. Rangaswami Ayyangar Avargal, is the only one of its kind in India and on it a number of millets are being studied. *Cholam* is the major millet of the Presidency and the greatest attention is being paid to it in consequence. It is usually grown as a dry crop and it suffers a great deal from vagaries of season. It flowers at night and this adds considerably to the difficulty of academic study. Two series of comparative trials were made one with white *cholam* and one

with yellow *cholam*. No outstanding strain of the latter has yet been evolved, but the whites have yielded a strain to be known as A.S. 15-13 which has shown itself to be distinctly superior. It will be given one more trial next year and then it will be ready for distribution to the ryots. Owing to the bad weather the main season comparative trials yielded no results this year and they will have to be repeated. A large number of characters of this millet are undergoing intense study for inheritance and a memoir on the subject will shortly be published.

86. Work on *Ragi* is in an advanced stage. Two series of comparative trials were laid down and a new strain E.C. 47 has definitely established its superiority over T. 8 and arrangements have been made to distribute this for trial on ryots' fields in the Coimbatore Circle, and several other strains are very promising. With this crop also an intensive study is being made of characters. Among minor millets, special attention has been paid to *korra* while work has been begun on *cumbu*. This crop presents special difficulties as it is protogynous and thus no absolute purity is possible. Valuable work has also been done on *Arika*, *Pani-varagu*, and *Kuthiraivali*. It will thus be seen that good progress has been made on this station which was only started in 1923. At that time, little or nothing was known about these crops which was of value to the plant breeder, but now not only has a mass of information been gathered, some of which will shortly be published, but the practical aim of the station, viz., the production of improved strains is actually in sight and two at least will be in the hands of the ryots in the coming year. The need for sub-stations has long been recognized by the Madras Agricultural Department who have developed a policy of opening such stations for breeding crops in different parts of the Presidency as the investigation proceeds. This has been done in the case of paddy and cotton and now the time has come for the millets to follow the same policy and the necessary sub-stations are projected. The first of these will be in Adoni to serve the needs of the Ceded districts. A site has been tentatively selected and, if water is found on it as a result of boring tests now in progress, it will be opened

in 1930. It will probably be a combined millet and cotton station, these crops being grown in rotation. This again is in accordance with advice of the Royal Commission who say, "work on a particular crop would, in all probability, prove of greater value if it were combined with work on another entirely different crop. An expert working on cotton would, for example, gain in freshness and preserve a broader botanical and biological outlook if he were to combine his work on cotton with work on some other crop which enters into rotation with it." Millet breeding work will also be taken up seriously on the existing stations at Hagari and Nandyal, now largely devoted to cotton, and deal especially with the white *cholams* or *tella jonnas* of Bellary and the yellow *cholams* or *pacha jonna* of Kurnool, Anantapur, and Cuddapah districts.

87. Further progress was made on the Anakapalle Experiment Station with the selection of pure strains of *ragi* and, despite the floods which rendered work on the main crop abortive, some very promising strains have been isolated. Experiments are also in progress on seasonal sowing which indicate that late sowing is advantageous.

(e) Coconuts.

88. Seed selection work, manurial trials, spacing and depth of planting experiments, are being undertaken on the Coconut Experiment Stations on the West Coast. With a perennial crop of this nature it will take a long time before significant results can be obtained, but the manurial plots are beginning to show differences.

89. On the three stations which were planted *de novo* some very interesting results are being obtained. At Pilicode No. I station, where the soil is a laterite, out of 336 trees planted in 1918, 76.8 per cent have flowered and 832 nuts have been harvested, and out of 198 trees planted in 1919, 63 per cent have flowered and 460 nuts have been harvested. On Nileshtar No. II station, where the soil is a red sandy loam, out of 516 trees planted in 1918, 88.7 per cent have flowered and 10,720 nuts have been harvested, and out of 237 trees planted in 1919, 84.3 per cent have flowered, and 2,286 nuts

have been harvested. On Pilicode No. III station where the soil is almost a pure sand, the trees are much slower. Out of 825 trees planted in 1918, only 20·9 per cent have flowered as yet.

90. A living collection of all the different varieties of coconuts in the world is being formed on these stations and this, together with the trees resulting from our present seed selections and crossings, will some day form a most valuable basis for economic and plant breeding work with this crop.

(f) *Fruit culture.*

91. In accordance with G.O. No. 669, Development, dated the 12th May 1923, a profit and loss account of the fruit gardens on the Nilgiris is shown below:—

	Pomological Station.		Burliar Garden.		Kallar Garden.	
	Expend- iture.	Receipts.	Expend- iture.	Receipts.	Expend- iture.	Receipts.
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Working charges.	1,941 2 11	...	1,471 1 6	..	2,427 13 8	...
Sale of fruits and plants.	...	2,647 7 4	..	1,925 3 9	...	901 8 0
Profit or loss	...	+706 4 5	...	+454 2 3	...	-1,526 5 8
Percentage of expenditure returned as receipts.	...	136·3	...	130·8	...	37·1

92. The pomological station and the Burliar Garden have this year been run at a profit and taking all these gardens together 93·7 per cent of the expenditure has been received in receipts as compared with 76·9 per cent last year.

93. The system of manuring and soil conservation by means of a cover crop of *Indigofera endecaphylla* which has proved so successful in recent years was continued at the Pomological station and another heavy crop of plums was obtained. Several varieties giving a succession of fruit can now be definitely

recommended. Hale with a yield of 48·3 lb. per tree, Alu Bokara with 33·6 lb., Shiro with 28·1 lb. and Kelsey with 38 lb. are specially recommended.

94. At Burliar, the mangosteen crop was an excellent one amounting to 2,667 lb. as compared with 972 lb. last year. The Australian oranges and durians are also beginning to bear. At Kallar, a good crop of loose jacket oranges was harvested, viz., 4,183 lb. as compared with 1,549 lb. last year.

(g) *Potatoes.*

95. It has been found as a result of experiments made on the Potato Experiment Station at Nanjanad that cattle-manure is indispensable for this crop whatever other manures are supplied, and therefore, means were sought for by which this material could be increased. By putting *Bracken*, *Eupatorium*, *Lobelia*, and other weeds, which can be collected on the waste ground, in alternate layers with the cattle-manure available in pits it was found possible to produce six tons of manure per head of cattle which on analysis proved to be of average quality. Experiments have now been laid down to test what kind of artificial manure is best to use in conjunction with cattle manure. There are indications that lime has little effect but that muriate of potash is important on these soils.

By means of deep ploughing and heavy manuring the second crop planted in August 1928 and lifted in January 1929 gave a 7·75 fold yield, a record for the station.

96. Experiments are also being tried to find the best crop to use in rotation with potatoes. *Samai* which is a new crop to the cultivators has proved very successful and it gave a yield of 663 lb. of grain and 2,308 lb. of straw. There is an increasing demand for seed of this cereal and 3,312 lb. were sold during the year.

The usual varietal tests were carried out and a feature of these was made at the annual flower show at Ootacamund where a large number of different varieties were exhibited for the benefit of the public.

(h) *Groundnuts.*

97. As stated in last year's report, some research work has been begun with this crop which is of growing importance in this Presidency. The acreage sown during the year under report was 3,336,536, the highest ever reached. I am happy to say that an Oil Seeds Specialist has been sanctioned in the coming year and one of his main duties will be the study of this crop. Meanwhile, a beginning has been made at a small experiment station at Palakuppam specially devoted to this crop. Here, varietal trials are being made as well as a number of cultural and manurial experiments.

98. A useful start has also been made with work on the academic side and the new Oil Seeds Specialist will be able to take this up straight away though Palakuppam need not necessarily be found the best place to establish a breeding station.

99. In favourable years such as that we have just experienced, there are two waves of flowerings. In the case of spreading varieties the interval between these waves is about a week, but in the case of erect varieties it may be as much as a month and the second flowering is of little value.

100. As mentioned last year, there is a tendency in the erect group for the pods to germinate in the soil after the 107th day and this was confirmed by the decrease in oil content at this stage. The spreading group show this oil deterioration between the 118th and 125th days and this synchronises with the second wave of flowering. The oil analysis indicates that the erect group is ready for harvest from the 100th day while the spreading group is ready from the 140th to 145th days. These discoveries have an important economic bearing as the ryots are apt to leave the crop on the ground too long for the best results as regards quality.

A promising beginning has been made with both single plant selections and with crossing.

(i) *Betelvine.*

101. A small experiment station was established at Vellalur in 1924-25 to investigate the cause of certain diseases which have attacked this crop and to discover whether there is any truth in the popular belief among

the ryots that earthworms are the cause of the trouble. All the results so far obtained go to show that the chief cause of the trouble is lack of drainage. When anything is done to improve the drainage such as raising the level of the beds, or liming the soil, marked increases in yield are obtained. No difference can be noted in the earthworm population of good and bad plots, but liming appears to reduce their numbers, and since this also increases the yield it would appear to be a solution of the problem which will please everybody. A new series of experiments are now being laid down to confirm the results before they are published and demonstrated.

(j) *Fodder.*

102. At the Hosur Central Cattle Farm where extensive experiments are being conducted with the growing of fodder, the rainfall during the year was fair, but late, and this was a disadvantage to the grass lands which did not respond as well as was hoped. All fodder growing is largely dependent for its success on the rainfall. A definite programme is being followed to extend the area under *kolukkattai* and other grasses in replacement of *spear* grass the natural herbage. Lucerne, under irrigation is very promising, but *berseem* is disappointing. A new system has been introduced of grazing standing grasses, even annuals like *chulam*, which reduces labour costs to a minimum. The yield of hay fell to 726 lb. per acre this year due partly to the late rain and partly to early cutting. This early cutting gives hay of a better feeding value. In the case of ripe *spear* grass bullock drawn combs were used which remove 70 to 80 per cent of the spears and improve the quality of the hay. *Rhodes* grass did well and the area under this valuable fodder is being increased.

103. The experiments conducted with these important and essential crops were continued on a number of the Experiment Stations. The results obtained on the Central Farm, Coimbatore, are given below:—

Crop.	Station.	Acre yield in lb.	Cost per 1,000 lb.		
			RS.	A.	P.
Maize	Central Farm ...	18,416	3	3	0
Chulam	Do. ...	16,734	3	4	8
Guinea Grass ...	Do. ...	22,607	...	...	...
Elephant Grass...	Do. ...	91,922	...	...	...
Lucerne	Do. ...	47,910	...	...	...

(k) *Dry crops.*

104. At the Taliparamba Experiment Station, experiments have been carried out over a long series of years with the object of demonstrating to the cultivators how their dry land can be most profitably handled. The local custom is to take a crop of hill paddy once in four or five years. This is a bad system of farming as the land once it is cleared suffers from soil erosion. If it is carefully bunded and regularly cropped with a rotation such as hill paddy, *ragi*, ginger, etc., a regular income can be obtained and the land improves in quality. This admittedly requires more expenditure and the ultimate profit depends upon the crops grown and a fluctuating market, but a reasonable amount can be made. During 1928, this profit amounted to Rs. 31 per acre. Over a period of 15 years, an average profit of Rs. 18 per acre has been obtained.

105. This improved system is rapidly being adopted and in the neighbourhood of the station large areas of land hitherto neglected have now been bunded and are under regular and rotational cultivation.

B.—CHEMISTRY.

106. The chemical section under M.R.Ry. Rao Bahadur B. Viswanath Garu, F.I.C., F.C.S., becomes of greater importance year by year. On its co-operation and help almost all phases of the department's research work depend. A great deal of the work is necessarily of a routine nature, the analyses of samples in connexion with the field work being done on the experiment stations, and of soil and manure samples for the public. Three thousand three hundred and nineteen samples were dealt with during the year, the largest number ever handled. Only twenty-two of these were made for ryots who still fail to make as much use of this section as they might; fifty-five were made for members of the United Planters' Association of Southern India.

107. On the purely research side, the most important items of investigations were the following:—

(a) *Soil surveys.*—The soil survey of Malabar was completed and published. This completes a series of six soil surveys dealing with the manurial requirements of the important paddy-growing tracts of the

Presidency. In view of the recommendations of the Royal Commission on Agriculture in India, it is not proposed to undertake any further surveys pending the decision on the subject by the Central Research Council.

(b) *Conservation of soil moisture.*—The black cotton soils in the Ceded Districts depend entirely upon the rainfall for their moisture and manurial applications do more harm than good when the rain is scanty and unevenly distributed. It is, therefore, of the utmost importance to discover the best means of conserving moisture in such soils and a series of experiments have been laid down for the purpose at the Hagari Experiment Station. It will be some years before any definite conclusion can be arrived at, but the results of this year indicate that the depth and frequency of ploughing, and the bunding up of the fields, are beneficial while removal of stubble and depth of sowing have little or no effect. A similar series of experiments have been laid down at Coimbatore as a check.

(c) *Plant nutrition.*—The investigation on the influence of manuring on the quality of the crop produced and on the cropping quality of the resulting seed and on the effects of organic manure in plant nutrition has been carried on now for five years and the main problem and the many other problems which have arisen out of this enquiry are still being dealt with. Since the publication of our results in 1927 independent confirmatory evidence of our conclusions have been forthcoming from other research institutions all over the world which is very encouraging and Rao Bahadur Viswanath is to be most heartily congratulated on the notice which has been taken of his work. Our problem now begins to centre round the optimum proportion of organic to inorganic manure for different soils and crops.

(d) *Conversion of refuse material into manure.*—Considerable progress has been made with this, usually referred to as synthetic farm yard manure, and it is now demonstrable to the ryots. It has been found possible to convert cotton stalks into useful manure and at the same time to destroy the stem weevil in them. We are now investigating the question of when and

how to introduce mineral nitrogen and phosphates into these composts and how the latter can be rendered soluble. Some promising experiments have also been made with the compressing of this "artificial" organic manure for transport purposes.

(e) *Green manuring of paddy*.—This is a subject which has for a long time been under study in our laboratories. It was begun by Dr. Harrison who published some results which have become classic. Recent investigations have revealed two new facts, viz., that in using green manure and mineral fertilizers in combination large quantities of the former renders the latter inactive, while with smaller doses artificials are very effective. That is to say, there is an optimum dose of green manure. What this is exactly we do not yet know, but it is probably about 5,000 lb. per acre. The other fact is that for paddy under swamp conditions green manure is more beneficial than cattle manure.

(f) *Manurial experiments*.—The results of several years' work on *calcium cyanamide* were compiled and published during the year. It may be said that it is a useful manure for rainfed crops, but with paddy it is of doubtful value at its present price. Despite an increased yield, manuring of paddy with *nitrate of soda* alone or in combination with organic manure does not appear to pay as well as manuring with either green manure or cattle manure under our conditions and it adversely affects the physical condition of our soils. The value of various phosphates in conjunction with sulphate of ammonia are now under study.

108. For a more detailed account of these and other investigations undertaken by this section I would refer those who are interested to the Administration Report of the Government Agricultural Chemist.

C.—BACTERIOLOGY.

109. The bacteriological section, which is a branch of the chemical section, was mainly engaged upon an investigation into the solubility of mineral phosphates by what is known as the sulphoprecipitation method. Recent work at Pusa and elsewhere has shown that the natural sulphur oxidising power of certain soil

bacteria make it possible to render phosphates like bone meal soluble in composts. The possibility of utilizing *Trichinopoly* nodules in this way is under study at Coimbatore.

Regular bacteriological analyses of milk produced at the dairy and purchased outside have been made. A very high grade of pure milk is produced at the college dairy.

D.—BOTANY.

110. This section was in charge of M.R.Ry. C. Tadulinga Mudaliyar Avargal, F.L.S., during the year in addition to his duties as Principal. He was called upon to identify a number (1,521) of specimens for different people as well as to supply seeds of economic value. The herbarium, which is an exceedingly valuable and useful collection of plants to be found in South India, was maintained and added to. The Flora of the Madras Presidency under preparation at Kew is based upon this herbarium and during the year Part VIII was published.

111. On the systematic side, two new species were discovered, named, and published during the year, *Senecio Ansteadii*, Jac. & Tad. and *Commelina Jacobi*, Jac.

112. A new and revised list of the herbarium specimens in the collection is under preparation and material for an illustrated and descriptive publication on the weeds of the Presidency, which has been in contemplation for some time, is now ready for the press.

113. A special botanist with an assistant who are working on *Ganja* for the Excise Department were attached to the section during the year for special training and study.

E.—MYCOLOGY.

114. The Mycological Section which is under the control of M.R.Ry. S. Sundararaman Avargal, M.A., deals with those diseases of crops which are caused by fungi, and research is conducted to discover the precise organism which produces the disease, and to study its life history and its behaviour under various conditions.

In some cases, fungi are found to have a definite relationship to insects and in these cases the section works in co-operation with the entomological section. The ultimate object is, of course, to suggest a remedy or a preventative method of control which can be adopted by the ryots. There is a growing tendency among mycologists all over the world now-a-days to pay more attention to preventative methods than to direct attack on the disease by means of sprays, and the importance of good cultural methods, and the possibilities of producing disease resistant strains is now being recognized. This aspect of the question has received our attention and work is done in co-operation with the agriculturists and the plant breeders on our staff.

Particular attention is paid to the diseases of the major crops naturally, but a number of minor diseases are also under study.

115. The investigation of paddy "blast" disease which is caused by a fungus known to scientists as *Piricularia oryzae* continued to centre round a search for disease-resistant varieties and for some specific manurial ingredients which might inhibit the development of the parasite on the host. As regards the latter, no significant results were obtained, nor in my opinion are they likely to be obtained. I know of no real evidence anywhere to indicate that the application of any fertilizer has a direct effect upon the incidence of a fungoid disease and this line of attack will, in future, be abandoned. Considerable progress has, on the other hand, been made with the search for resistant varieties. G.E.B. 24 and Co. 1 are known to be remarkably resistant to the disease and these have been utilized for crossing with *Korangu samba*, a popular variety of paddy in the Tanjore delta which is unfortunately very susceptible to attack. This year's research has revealed another highly resistant variety in Co. 4 and there is a possibility, therefore, of evolving some new resistant strains. The Paddy Specialist is devoting his attention to this problem.

116. The "mosaic" disease of sugarcane continued to receive study. This disease has been proved in other countries to be spread by certain species of *Aphis*, but a study of these insects here has given so far

negative results and we are still ignorant of the insect vector which is responsible for secondary infection. Our studies have revealed the fact that certain varieties of cane are highly resistant to the disease and it is probable that here again the solution will be the evolution of resistant varieties. At the same time, we have found that the disease can be very largely controlled by the careful selection of setts for planting from disease-free stools of cane. It has been found possible to stamp the disease out on our Experiment Stations by this means and the method is now being demonstrated to the ryots by the district staff.

117. It is of great interest to note that among the minor crop pests a *mosaic* of *ragi* has been discovered. There is a distinct danger of sugarcane *mosaic* spreading to *cholan* and *ragi* as was pointed out by the Imperial Mycologist at Pusa, and this is why it is of such great importance to find a remedy for the major disease.

118. The boll rot and seedling *blight* of cotton has received a great deal of attention and it has been discovered that the fungus responsible for it is carried in the seed coat and attempts are now being made with treatment of the seed prior to sowing and with spraying the seedlings. It is possible that a practical method of control will be discovered along these lines.

119. The "pollu" disease of pepper still defies control. This interesting disease is a combination of physiological spike fall, the attack of a fungus *Colletotrichum necator*, and that of an insect, a flea beetle *Longitarsus nigripennis*. All attempts at controlling the disease by spraying have resulted in failure since the sprayed vines are attacked by mealy bug scales which cause more damage than the "pollu" itself. The conclusion has been reached that little or nothing can be done to attack this disease directly and that a search must be made for disease-resistant varieties. Once more we must appeal to the plant breeder to deliver us from our troubles.

120. Work on the *wilt* disease of groundnuts has revealed the fact that it is spread by infected seed, but also that certain cultural operations like liming the soil and deep cultivation will aid in the control of the disease.

121. A very interesting piece of work has been done on a disease of plantains which appeared recently in Madura District. The fungus found was submitted to Dr. Wollenweber, a continental specialist, and he has identified it as that which causes the famous Panama disease of this crop. Attempts are being made to discover resistant varieties.

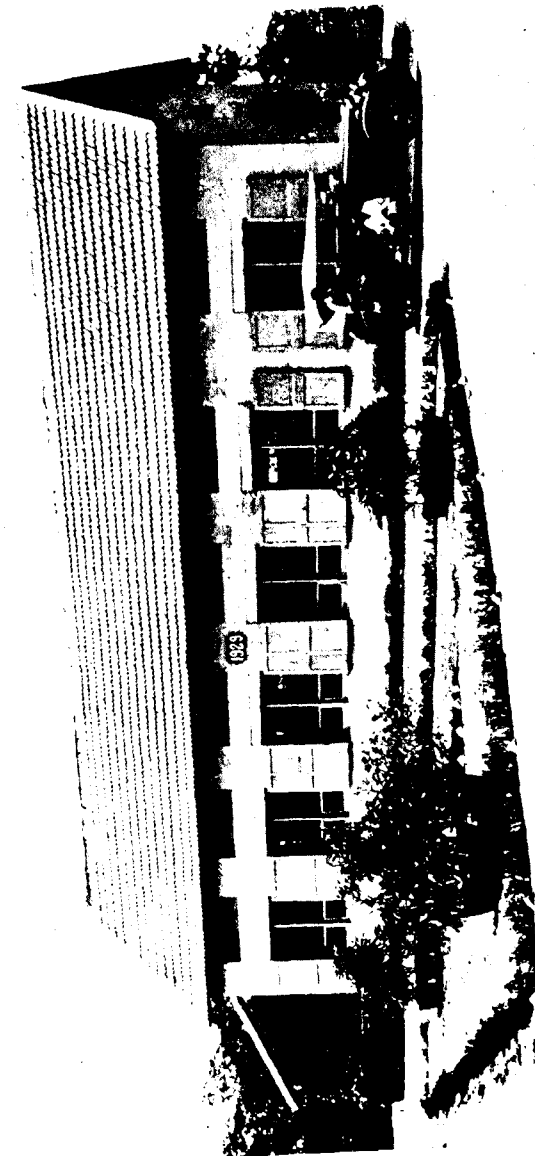
122. A large number of minor diseases of various crops have been investigated during the year and 61 specimens, representing a wide range, were submitted to us from all over the Presidency. These were carefully examined and advice was given wherever possible.

123. Owing to lack of staff and the pressure of the economic side of the work, very little attention could be paid to the purely academic side of mycological study, but some progress has been made with the examination of the sooty moulds of South India.

F.—ENTOMOLOGY.

124. This section, which is under the control of M.R.Ry. Rao Sahib Y. Ramachandra Rao Garu, M.A., F.E.S., deals with the insect pests which attack crops. Their name is legion as will be gathered from a perusal of this officer's Administration Report. Research is devoted to the intense study of the life-histories of these insects, and especially to their natural enemies, the aim being to discover a simple remedy or control measure which can be adopted by the ryots.

125. The most important event of the year was the discovery of the notorious fluted scale, *Icerya purchasi*, on the Nilgiris. From the extent of infestation in more than one centre it is evident that the insect had been present for one or two years. It must have made its entry by way of imported nursery stock. I agree with the Government Entomologist that the precautions now adopted for the prevention of the introduction of pests into South India from outside need to be drawn a great deal tighter. We have had several instances of late of the introduction of pests despite the regulations on the subject. A scale insect was imported into Tuticorin without the knowledge or permission of the agricultural authorities with the



THE NEW INSECTARY AT THE AGRICULTURAL RESEARCH INSTITUTE, COIMBATORE.

object of destroying prickly-pear, the desirability for which is by no means universally conceded. Again there is a great danger of introducing *Stephanoderes*, a borer beetle, which has done a great deal of damage to coffee in Java. Proposals have been laid before the Government of India to guard against this latter pest by prohibiting the importation of coffee into South India except it be roasted or ground.

126. To return to the *Icerya* scale. The only way to combat this pest successfully is to introduce its parasite, the *Vedalia* beetle, and steps were at once taken to do this. We met, however, with an unexpected difficulty for wherever this parasite has been used it has proved so successful that not only has the scale disappeared but the beetle also and it is now difficult to obtain supplies. Arrangements were, however, made to get consignments from various places. Unfortunately, the first consignment which arrived were all dead, but later consignments were successful and at the present time (August) stocks are being reared for release.

127. During the year 271 enquiries, reports or requests for help in connexion with insect pests were received. Of these 132 cases were attended to personally by the staff of the section and the rest were dealt with by correspondence. Whenever possible remedies were demonstrated to the ryots. A number of definite campaigns against special pests were conducted and these are described under the heading of "Demonstration" in another section of this report.

128. On the academic side a study was made of *Acari*, *Syrphids*, *Earwigs*, *Synmids*, *Chrysomelids*, *Thysanoptera*, *Termites*, *Muscidae*, *Stratiomyidae*. Consignments of insects were sent as usual to the Bureau of Entomology, London, and to specialists in Europe and America for identification and study.

G.—HORTICULTURE.

129. The Botanic Gardens at Ootacamund and Coonoor become more and more popular every year. They are a very favourite public resort in the evenings and are particularly frequented by ladies and gentlemen of the Indian community. The gardens at

Ootacamund are of worldwide fame and contain as fine a collection of trees and shrubs as will be found anywhere. The economic side of such gardens is necessarily limited, but their aesthetic value is considerable and the money spent on them is well worth while from the point of view of public health and happiness. They undoubtedly add very much to the attractions of our popular hill stations. Their excellent condition reflects much credit on the Curator, Mr. F. H. Butcher.

130. At Ootacamund, the conservatories are always popular. The upper one contained throughout the year many kinds of plants in bloom, among the most noteworthy being collections of *Nerines* and *Orchids*. The lower house contains many interesting plants including several species of *Bromeliads* and *Clivias*.

131. Three new species of trees were planted out during the year, two of them brought out from England in 1927. These were *Eugenia apiculata*, *Melaleuca hypericifolia*, and *Cupressus hindleyi*. There is only one native tree of this latter in the gardens.

We are much indebted to a large number of people who kindly presented plants and seeds to the gardens during the year.

132. *Economic work*.—Though the economic side of the gardens is restricted it is nevertheless not neglected. Considerable interest is being taken in commercial circles in tung oil used for the preparation of high grade varnishes, the source of which is several species of *Aleurites*. Seeds of one of these species, *A. Fordii*, have been obtained from several sources and attempts are being made to raise plants. Several varieties of grape vine cuttings imported last year have rooted well and a stock of cuttings is being raised for distribution. A number of seedling of *Gambier*, a valuable tanning plant, have been raised and these will be tried in suitable localities. *Cephaelis ipecacuanha* is cultivated at Kallar. Among fodder grasses, *Kikuyu* (*Pennisetum clandestinum*) has established itself on the lawns and there is much demand for plants. Seed of *Bromus unioloides* has been produced.

The nurseries are kept fully stocked and there is a steady demand on them from the public as witnessed by the fact that the receipts from the sale of plants

alone was Rs. 2,502 which is Rs. 431 more than last year.

133. The following is a statement of the expenditure and receipts for the official year under report, but as pointed out in former reports it is unfair to charge the whole of the salaries of the Curator and his staff to the Gardens as they also have charge of "Government Parks," the Potato Experiment Station at Nanjanad, and demonstration work in the district.

	Government Gardens, Ootacamund.		Sim's Park, Coonoor.		Other Public Gardens and Parks.	
	Expenditure.	Receipts.	Expenditure.	Receipts.	Expenditure.	Receipts.
	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A.
Salaries and allowances.	17,037 6 0	...	1,502 4 0	...	...	...
Capital outlay ..	747 5 10	...	65 7 0	...	...	...
Rates and taxes.	861 3 6	...	127 6 4	...	...	...
Working expenses	9,648 8 2	...	3,510 12 3	...	3,527 1 1	...
Repairs ..	1,128 2 9	...	91 4 0	...	...	...
Miscellaneous	593 14 4	...	1 8 0	...	...	...
Sale of seeds and plants.	...	3,734 12 9	...	1,124 9 2	...	...
Sale of flowers ..	...	1,910 0 0	...	190 11 0	...	...
Sale of catalogues, etc.	...	115 8 0	...	36 11 6	...	...
Miscellaneous ..	...	136 8 0	...	218 12 0	...	203 3
Total ..	30,016 8 7	5,896 12 9	5,298 9 7	1,570 11 8	3,527 1 1	203 3

H.—PEPPER.

134. This crop has been studied at the Taliparamba Experiment Station since 1905 when it was opened for this purpose. The yield of pepper is very much influenced by the prevalence or the reverse of "pollu" disease which again depends upon climatic conditions. This year "pollu" was very bad indeed and took toll of 50 per cent. of the crop. There appears to be no direct cure for this disease unless a resistant variety of vine can be found. A long series of experiments have shown *Kalluvalli* to be the highest yielding variety of pepper and the manurial experiments which have been carried out over a long period have shown the value of a combination of nitrogen and phosphate and also of lime. An entirely new series of experiments has been

laid down this year with newly planted vines of the *Kalluralli* variety, to test out the actual value of lime with various combinations of manures.

I.—GENERAL INVESTIGATIONS.

135. Help was as usual given freely to other Departments and public bodies who asked for it. The problem of the storage of *Ganja* which has been under investigation for the Excise Department for some years was completed. The botanical side of the cultivation of this drug has been taken up and botanical assistants of the Excise Department are working with our Botany Section.

The Principal, Pithapur Rajah's College, Cocanada, was supplied with 50 named and mounted herbarium specimens.

Seeds of *Spinifer squarrosus* were supplied to the Executive Engineer, Cochin Harbour.

136. The Livestock Section are working in co-operation with the Health Department in trying to improve the condition of the cattle yards in Madras, and also visit the milking shed at the general hospital once a month to ensure that clean milking is done. This section selected and purchased a Kangayam bull and ten cows for the Ceylon Government.

137. The Mycological Section rendered help to the Imperial Sugarcane Expert with reference to *mosaic* disease and the examination of cane material being distributed in India and foreign countries. Cultures of *P. Palmivora* were supplied to the Imperial Bureau of Mycology at Kew, while nearer home Mr. D. A. Vasudevan of the Madras Medical College was given facilities at Coimbatore to study Madura Foot disease caused by a fungus, *Mycetozoa*, and the Sericultural Section of the Industries Department was helped with a *mildew* disease on the Mulberry plantation at Coonoor.

138. Work is being done at the Hosur Central Cattle Farm in collaboration with Mr. Warth, the Imperial Physiological Chemist stationed at Bangalore.

139. The Chemical Section made analyses of fish and fish meals and oils for the Fisheries Department, of foodstuffs, milk, and edible oils for the Jail

Department, and of brans and straws for the Veterinary Department. The Government Agricultural Chemist at the request of the Madras University delivered a series of six lectures in Madras for the benefit of honours students. The general subject dealt with was "research in agricultural chemistry with special reference to South India."

140. A set of samples of *sorghum* was sent to Kew at their request and seed of various millets were supplied to Ceylon, Burmah, Assam, United Provinces, and Hyderabad.

141. At the request of the Executive Engineer in charge, advice was given on the Sewage Farm at the Mettur Project. This farm has proved a great success and has now 15 acres under fodder grasses for which there are a good demand from the surrounding ryots. Cotton, plantains, and sugarcane are also being tried.

142. An agricultural demonstrator was again sent to the Laccadive Islands to demonstrate improved methods of coconut cultivation and a special visit of inspection and advice was also paid to these Islands by the Deputy Director of Agriculture, VII Circle.

143. The Devadhar Malabar Reconstruction Trust Farm at Tanur was conducted by the Department and the Chalam Forest coconut plantation was also departmentally managed for the Forest Department. The mental hospital at Calicut and the Central Jail at Cannanore were also given regular advice about their gardens and farms. A great deal of progress has been made at the Cannanore Jail, where a breeding bull is maintained and silage has been prepared. Two Wardens were sent for training on our Experiment Station during the year.

V.—LIVESTOCK.

144. The Livestock section in charge of Mr. R. W. Littlewood is a large and important part of the work of the department. Four cattle farms are maintained, the largest being at Hosur which serves the centre, south and west of the Presidency. Here 567 head of stock are kept. At Chintaladevi, a farm is maintained for the study of the Ongole breed and 167 head of

stock are kept. At Guntūr, there is a small farm devoted to the study of buffaloes, while at Coimbatore a milch herd is maintained at the Agricultural College supported by the model dairy for teaching purposes.

145. The primary object of these farms is breeding, and though in many cases an improved milk yield is being aimed at in the cattle, actual milk production on the farms themselves is a secondary object. Our ultimate aim is to produce bulls of the best type for distribution in various parts of the Presidency and to rear a sufficient number of them to produce an effect on the country cattle. This necessitates the keeping of a number of different herds, and it also needs time as breeding is slow work. The Kangayam is accepted all over the centre and the south as good general purpose animal, while the Scindhe is probably the best type for the West Coast where the animals are very poor. Cross-bred bulls and milch cattle are produced to serve Madras and the Nilgiris hills as well as the Coimbatore dairy. The work of this section, therefore, covers a wide and varied programme.

146. *Cross-breeding.*—The object of this work is to arrive at a decision as to whether the cross between an Ayreshire and the Scindhe and Sanhiwal will result in a permanent improvement of milking powers. The Royal Commission on Agriculture in India unhesitatingly condemned this work and were of the opinion that it should be stopped. I am unable to agree with them and feel that their opinion was based on wrong conclusions for the results we have obtained amply justify the continuation of the experiment.

147. The plan adopted is to mate half-bred bulls with half-bred cows (F_1), the progeny of this mating being second generation crosses F_2 . This F_2 stock are mated together and their progeny is F_3 , and so on. In this way, the half and half ratio of Ayreshire and Indian blood is maintained. It is naturally slow work as each generation takes at least three years before it begins to reproduce itself, and moreover we are only able to work on a small scale and with a small herd. Our ultimate goal is a good milch animal of good constitution and size which will calve regularly each year.

148. We have reached the F_4 generation, but none of them are yet in milk. The numbers in the herd are F_1 , 27 ; F_2 , 25 ; F_3 , 23 ; and F_4 , 5.

149. Four F_1 cows yielded over 7,000 lb. of milk in their last lactation and the best cow gave 9,732 lb. with a daily average of 28.9 lb. which is a record for the farm. Another cow gave 8,378 lb. with a daily average of 26.3 lb.

150. Twelve F_2 cows were in milk during the year and six yielded over 5,000 lb. in their last lactation. The best cow gave 8,276 lb. with a daily average of 19.1 lb. and she is still in milk, while No. 84 the best at present has a daily average of 26.2 lb. and her maximum yield in one day was 34 lb.

151. Four F_3 cows were in milk, the best having given 4,806 lb. with a daily average of 16.3 lb. These, of course, are young animals and first calvers, and may be expected to improve as they grow older. Milk yields of this magnitude could never be hoped for from indigenous pure bred cattle which are however being studied.

152. *The Coimbatore herd.*—This herd consists of cross-breds with various proportions of imported blood in them derived from various breeds. It is maintained to augment the milk supply of the dairy and to supply second-class milk cows for the public for which there is a demand.

153. *The Ongole herd.*—This herd was started in 1918–19 at the Ongole Cattle Farm at Chintaladevi in the Kavali taluk of the Nellore district, and it is now maintained on this farm and at Hosur. The object is to improve the Ongole breed and to raise a pedigree herd by careful mating, rearing, and selection, and to provide a source of good breeding bulls with a high milk strain for issue to different localities in the Presidency. This valuable breed had begun to suffer due to promiscuous breeding and communal grazing.

154. A very trying season has been experienced as the South-West monsoon failed and the North-East monsoon was late. In addition to this, the Mopad channel gave no supply to the farm. Despite this progress was made. The herd consists of 281 head of cattle. Five bulls were sold during the year for

breeding purposes and 42 cows belonging to ryots were served. The ryots are now beginning to realize the value of our bulls and the demand for services is gradually increasing. The calves born to these bulls were true to type.

155. As a result of careful mating and selection, the milk yield of the herd is being raised year by year. The average per cow has been as follows :—

1925-26	...	...	...	...	...	8 lb.
1926-27	...	...	...	...	...	9 "
1927-28	...	...	...	...	...	10.1 "
1928-29	...	...	...	...	...	11.2 "

The best cow in the herd gave 4,939 lb. of milk with a daily average of 16.5 lb. and is now in milk again and has given 2,486 lb. with a daily average of 21.4 lb. Other individual yields were, cow No. 101, first lactation 5,356 lb. with a daily average of 14.7 lb., second lactation 4,343.7 lb. with a daily average of 14.1 lb. and still in milk, and cow No 100, first lactation 5,421.7 lb. with a daily average of 14.5 lb., second lactation 3,830 lb. with a daily average of 16.4 lb. and still in milk giving 9.5 lb. a day. Both these cows were farm bred. These are very satisfactory and promising results, and given time we shall have a valuable source of supply of good breeding bulls at this farm. Ten were sold for breeding purposes this year. It should be remembered in this connexion that the average yield of the country bred Ongole is only 2,500 to 3,000 lb. per lactation, and the yields of some of our farm cows compare favourably with those of good Scindhe cows. At the same time, they do not come up to the yields from cross-breds.

156. *The Kangayam herd.*—This is maintained at Hosur to produce a supply of good breeding bulls for distribution and at the same time efforts are being made to try and improve the milk yield. The herd contains 146 animals. Four cows yielded over 2,000 lb. of milk, the best giving 2,848 lb. with a daily average of 9.9 lb. Ten bulls were issued during the year for breeding purposes and some promising young animals are being reared.

157. *The Scindhe herd.*—This is also maintained at Hosur. The aim is to build up a herd of cows with a high milk yield which will breed regularly. Bulls will



CHAMPION KANGAYAM BULL, TIRUPPUR SHOW.

be distributed where milk is the object, and it is also proposed to place stud bulls of this breed on the West Coast in order to try and improve the cattle there. Seven bulls were issued during the year. The best cow gave 3,964 lb. of milk with a daily average of 12 lb.

158. *The buffalo herd.*—This herd is maintained at Guntūr on a farm in the Lam reserve which was first opened in 1923. The object of the farm is of a two-fold nature ; first of all to improve the size and the milk yield of buffaloes by crossing country-bred stock with Delhi bulls, and secondly to demonstrate to the ryots and milkmen of the district, where buffalo breeding is largely carried on, how to rear and feed their stock in order to obtain the best results. Satisfactory progress has been made with both these objects and there is now a greater demand for services from our bulls than we can as yet supply. Experience has shown that young bulls are not ready to serve till they are three or four years old and we have not yet had time to build up a sufficient number. Eighty outside services were, however, performed and three bulls sold for breeding purposes.

159. As regards the first object, the following results show that it is being attained. Four pure Delhis have averaged 4,686 lb. of milk per lactation with a daily average of 14·1 lb. Five three-quarter-breds have averaged 2,973·6 lb. per lactation with a daily average of 10·4 lb. These are all first lactations and they are in calf again with a daily average of 17·1 lb. Ten half-breds have averaged 2,939·9 lb. per lactation with a daily average of 10·2 lb. and in their present lactation they are averaging 13·4 lb. a day.

160. The best individual results are the following :—

Cow.				Total yield.	Daily average.	Remarks.
				LB.	LB.	
No. 6	...	...	...	5,714·5	16·1	Pure Delhi. First lactation.
				2,720·8	21·8	Still in milk with 16 lb. per day.
No. 29	...	...	...	1,047·3	16·4	Daughter of No. 6. Still in milk.

Cow.	Total yield. LB.	Daily average. LB.	Remarks.
No. 20	5,237.1	15.5	Three-quarter-bred Delhi. First lactation.
	2,207.2	21	Still in milk. 18 lb. per day.
No. 12	4,125	14.7	Half-bred Delhi. First lactation.
	2,653.1	16.4	Still in milk. 10 lb. per day.
No. 15	4,235.5	11.6	Half-bred Delhi. First lactation.
	2,424.3	15.1	Still in milk.

161. A very favourable season as regards rainfall has been experienced on this farm, but a great deal of difficulty is usually experienced about water. A boring has been made, but it has reached 150 feet without striking water and in view of this we shall probably have to change the farm to another site and this is now being considered.

162. *Stud bulls.*—As already stated the primary object of all the cattle farms is to raise a stock of good bulls and to place these at stud to improve the ryots' cattle. The farms are still young and our stock is small and progress is admittedly slow, but still progress is being made. There are in all 24 Government bulls at stud outside Madras compared with 16 last year.

163. Eight bulls were maintained at the Veterinary College, Madras, during the year and 427 animals were served. It would have been a record year had there not been a stoppage owing to an outbreak of foot-and-mouth disease and another to allow the animals to be inoculated against rinderpest. The effect of these bulls was seen very plainly at the S.P.C.A. Show. This year, as usual, the department gave prizes for the best calves born to their bulls and those which competed were a good lot and showed a distinct improvement in care and feeding. The buffalo calves, however, were a miserable lot and leave room for an immense amount of improvement.

An Ayreshire bull "Glenside Aviator" is stationed at Ootacamund, and he performed 59 services during the year.

164. Seven bulls were placed at stud in six veterinary hospitals in different places in the Presidency and these performed 143 services during the year and in addition to this the Government bulls at other Experiment Stations performed a number of outside services.

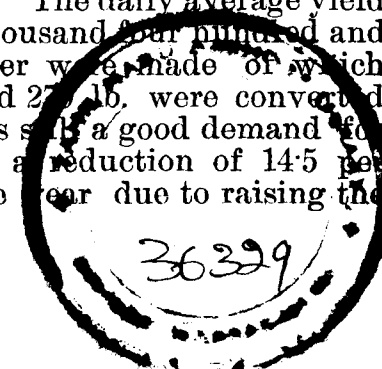
165. The following is a list of the services performed by Government bulls at stud:—

	Cows.	Buffaloes.	Departmental.
Hosūr	...	...	250
Coimbatore	142	166	78
Chintaladevi	42	...	74
Guntūr	...	80	19
Madras	194	233	...
Ootacamund	59	...	...
Kovilpatti	37	232	...
Mangalore	75	...	...
Madura	23	...	...
Conjeeveram	23	...	...
Mayavaram	8	...	...
Guntūr	14	...	...
Total	619	511	421

166. *Premium bulls.*—Grants of Rs. 100 per annum are given towards the cost of maintenance of good breeding bulls approved by the department provided that each serves over 40 cows in the year and is well housed and fed. There are 36 bulls under this scheme of which 24 were bred on our farms.

167. *Sales.*—Twenty-seven bulls and twenty-two cows with eight calves were sold during the year for breeding purposes the sale proceeds amounting to Rs. 8,880. In addition to this, 82 other animals were sold for Rs. 3,025.

168. *Coimbatore dairy.*—During the year 46 animals in the herd were inoculated against rinderpest by the serum simultaneous method in two batches during January and February, 38 of them being done for the second time. This reduced the milk yields though none of the animals went dry. The daily average yield per cow was 14.4 lb. Eight thousand four hundred and seventy-two pounds of butter were made of which 8,053 lb. were sold as such and 27.1 lb. were converted into ghee and sold. There is such a good demand for our butter though there was a reduction of 14.5 per cent in the sales during the year due to raising the



price. The dairy is run on a commercial account system and the total receipts were Rs. 34,085 which is Rs. 704 more than last year. Nothing is credited to the dairy for teaching the students at the college or for the maintenance of the stud bulls and the cost of experimental work, so that it cannot be looked upon as being run on strictly business lines despite the fact that commercial accounts are kept.

169. The survey of the Ongole cattle was continued and the work in the Palnād, Sattenapalle, and Vinukonda taluks was completed.

170. *Transport of milk.*—In any general dairy proposition the question of milk transport arises. Some interesting trials at Chintaladevi showed that milk drawn at 6 a.m. could be transported 36 miles by motor bus and it remained sweet for eight hours during the hot summer months and for fourteen hours during the monsoon months.

171. *Sheep.*—The flock of sheep kept at Hosur numbered 242. Shearing was done twice in the year and the average yield of wool was 2 lb. 6 oz. as compared with 2 lb. 4 oz. last year. The best yields were from two rams, viz., 7 lb. 2 oz. and 6 lb. 4 oz., respectively.

172. *Poultry.*—The Agricultural Department has not taken up the subject of poultry seriously owing to lack of staff for the purpose. Too much remains to be done with cattle improvement for the department to be able to afford to expend its limited resources on poultry. Imported utility breeds are kept, however, so that a few birds and eggs can be produced for distribution.

173. A small poultry centre was opened at the *Cheruma* Centre at Perintalamanna from which eggs and birds are sold at a cheap rate to the *Cherumas*. Up-to-date houses and runs have been erected as a demonstration and the centre is in charge of a *Cheruma* who was trained at Coimbatore.

174. *Pigs.*—These are kept to consume by-products. There is a ready sale to pork butchers and 43 were disposed of. This year 11 were sold for breeding purposes.

175. *Finance.*—It is of interest to note that the following sums have been realized during the year by this section :—

				RS.	A.	P.
By sale of cattle	...	...	...	11,904	15	0
" pigs	...	...	...	1,021	8	0
" sheep	...	...	...	639	0	0
" poultry and eggs	...	...	...	963	14	5
" dairy produce	...	...	...	34,085	5	2
Total	...	...	...	49,214	10	7

176. *Animal nutrition.*—At the Hosūr Central Cattle Farm facilities are being given to the Imperial Physiological Chemist stationed at Bangalore to conduct some feeding tests. These are not yet complete and the results will be published by Mr. Warth. Three experimental silage pits of *chulam* harvested at different stages were made for the Physiological Chemist.

177. With the erection of special buildings last year and the appointment of a special officer we were this year in a position to carry out work on this very important branch of cattle work for ourselves. Our programme was discussed with the Imperial Physiological Chemist to whom I am greatly indebted for advice. The main problem under investigation was the determination of the extent to which the more commonly used feeding stuffs in this Presidency are digested by farm animals. To avoid waste and needless expenditure it is necessary to possess accurate knowledge of the digestibility and composition of these feeding stuffs. At present, we are dependent upon standards fixed in Germany and America, but these do not agree with Indian conditions. We have, first of all, taken up the problem of the maintenance ration for a working animal, that is to say, the amount of roughage and concentrate which would maintain an animal at rest in condition. When this is known an additional ration can be given in accordance with the nature of the work the animal is called upon to do. Several questions of technique had to be dealt with, but these were satisfactorily overcome and the year's work may be summed up as follows:—Roughage fed in the form of irrigated *chulam* fodder of the *chitrai* variety is not sufficient to meet the requirements of resting catabolism

in a mature Ongole bullock of 1,000 lb. live weight even when fed *ad libitum*. The level of protein requirement in the form of groundnut cake for bullocks at rest is in the neighbourhood of 100 to 150 grammes of digestible protein in contradistinction to the 250 to 300 grammes laid down by American and European investigators.

A very satisfactory start has been made with this work. For details I would refer those interested to the Administration Report of the Government Agricultural Chemist under whose charge the investigation is being carried out.

178. We have had repeated trouble with cows which have required repeated services before they conceived. In the Journal of Agricultural Science for September 1928, Sir Arnold Theiler published an announcement that supplementing a ration with bone-meal resulted in reduced mortality, reduced incidence to disease, and increased fertility of cows. Following this up a series of systematic experiments on the effect of supplementing the ration of young calves with bone-meal and lime have been laid down, but it is as yet too early to say anything about results.

VI.—DEMONSTRATION.

A.—OPERATIONS AGAINST DISEASE.

179. *Application of the Pest Act to cambodia cotton.*—The Act was applied as usual in the taluks of Omalur, Tiruchengōdu, Salem, Nāmakkal, and Rāsipuram in the Salem district, Karūr, Kulittalai, Musiri, Trichinopoly, and Lalgudi in the Trichinopoly district, in the whole of the Madura district, and in the Coimbatore district except the Kollegal taluk and a few villages in the Pollachi taluk.

180. The Act makes it illegal to have cambodia cotton on the ground after 31st August and no individual notices need be given to the ryots to remove their cotton. In order to educate the people as to its necessity and to help the Revenue authorities to enforce the Act, agricultural officers were posted for this work from 25th August to 15th September. In the Coimbatore district, the eradication was not done promptly, with the exception of the taluks of

Udamalpet and Dhārāpuram, and in some cases it was not cleared until 15th September. Work in the Salem district was carried out more expeditiously. One hundred and thirty-five prosecutions were necessary.

181. *Application of the Pest Act to palm disease in Northern Circars.*—The usual methods of dealing with this disease were adopted, viz., cutting and burning of dead palms and inspecting trees within fifty yards of diseased trees and treating those found to be affected. In tracts where the disease was bad, the patrolled belt was 205 yards in depth. The work has for some years been in charge of a Special Deputy Collector and it has been carefully and conscientiously done and is beginning to have a marked beneficial effect. There is undoubtedly a remarkable decline in the damage done by this disease, but the Act will have to be kept in force for many years to come. The fall in the number of diseased trees in East Gōdāvari, which is the home of the pest and where it was at one time virulent, is remarkable and the figures of dead and infected trees which have had to be cut each year are worth quoting, viz.,

1923	...	...	...	...	...	...	16,293
1924	...	...	...	...	...	...	15,717
1925	...	...	...	...	...	...	14,488
1926	...	...	...	...	...	...	11,413
1927	...	...	...	...	...	...	7,600
1928	...	...	...	...	...	...	4,814

In West Gōdāvari and Kistna, the figures have of late years remained practically stationary, though they have been reduced from those in 1925 and 1926, showing that the disease is being held in hand. In Guntūr, a slight increase in incidence is shown and this area will receive increased attention.

182. *Application of the Pest Act to the coconut caterpillar.*—It has been explained in former reports that an organized attempt is being made by the department to control this pest by a biological method, the introduction and liberation of its natural parasites. The Pest Act was in operation during the year in both Malabar, where 90,000 palms were treated, and in South Kanara where 30,000 trees were cleared, and it has worked quite smoothly. In the latter district the pest is now under reasonable control. In Malabar, however, it is

still spreading rapidly and a number of new centres of infection had to be dealt with. It was found necessary to open a third laboratory for breeding parasites at Ponnani and the intensity of the work may be judged from the fact that the following number of parasites were bred in the laboratories and released; *Eutophia* 500,000, *Bethyrid*, 10,000, *Microbracum*, 5,000, and *Elasmus*, 2,000.

The Entomologist of the Cochin State is working in collaboration with us on the border.

183. *Spodoptera*.—Both in 1928 and 1929 a campaign was carried out against this pest with a fair amount of success, especially in the “Kole” area. A special study is being made of the outbreak of this pest on the hill grasses which may have an important bearing on the attacks on paddy.

184. *Hairy caterpillar*.—Demonstrations of the method of dealing with this pest by means of hand-picking in its early stages were given as usual and arrangements have been made to work in co-operation with the Mysore State Agricultural Department in the villages on the border. In answer to a request from a large number of residents in the villages of Adankurichi and Mudhukulam, proposals have been made for putting the Pest Act in force against this pest in this area. Past experience has not made me enamoured of legislation in these matters, but as there appears to be a popular demand for the Act in this case, I can only hope that the people themselves will see to its strict enforcement.

185. *Anti-smut campaign*.—The treatment of *jonna* and *cholam* seed with copper sulphate before sowing as a protection against *smut* was continued as usual. In the III Circle, 59,348 acres were sown with treated seed.

186. *Special demonstrations*.—In the case of some pests and diseases where a reliable remedy has been found special demonstrations of control measures have been given, which though hardly worthy of calling “campaigns” are of value. The following are worthy of record:—

- (a) Spraying against mango mildew at Gangavalli,
- (b) Spraying against citrus mildew at Kiliyur,
- (c) Spraying against grape mildew at Penukonda,

- (d) Operations against coconut shoot and leaf rot at Charavattur,
- (e) Operations against the stem bleeding disease of coconut at Narasapur, Kille, and Pōdanūr,
- (f) Spraying with lime sulphur against grape anthrachose at Michaelpatti.

B.—DEMONSTRATION PLOTS.

187. As in previous years a large number of demonstration plots were arranged. The results of many of these will be found tabulated in the administration reports of the circles. The results obtained on such plots are necessarily affected by vagaries of the weather, but they are still of great value and they appear to be generally appreciated and I receive many requests that I will arrange for still more.

188. The results of demonstrations with manures indicate that better yield and larger profits can be obtained by the judicious use of the nitrogenous and phosphatic artificial manures such as sulphate of ammonia, superphosphate, and bone-meal in conjunction with organic manure than by the use of organic manure alone. The exact proportion to use varies no doubt with soil and climate, but speaking quite generally 80 to 120 lb. of sulphate of ammonia and 1 or 2 cwts. of superphosphate or bone-meal per acre is a suitable quantity. In the case of green manure, not less than 5,000 lb. per acre should be used.

C.—EXHIBITIONS.

189. The department participated in both the Fair at the People's Park in Madras during Christmas week and in the Health Exhibition. At the latter, an exhibition was staged to show how national health and prosperity depend upon agriculture and a special feature was a number of models and demonstrations, such as model farm yards, cattle sheds, etc., and the malting of *cholam* as a cottage industry. The second prize was awarded to our section the first being won by the Health Department itself, a very gratifying result. A great deal of time and trouble was taken by the agricultural officers concerned for which I am grateful.

190. Another exhibition worthy of notice was one held at Udamalpet at the time of the third

Coimbatore District Kammavar Conference. A special feature of this exhibition was that a number of firms dealing in implements and manures participated. Engines and pumping plants, tractors, and implements were shown at work.

191. For the fourth year in succession an exhibition and a series of lectures were given at Cannanore for the benefit of the Indian Territorial Force as well as the general public.

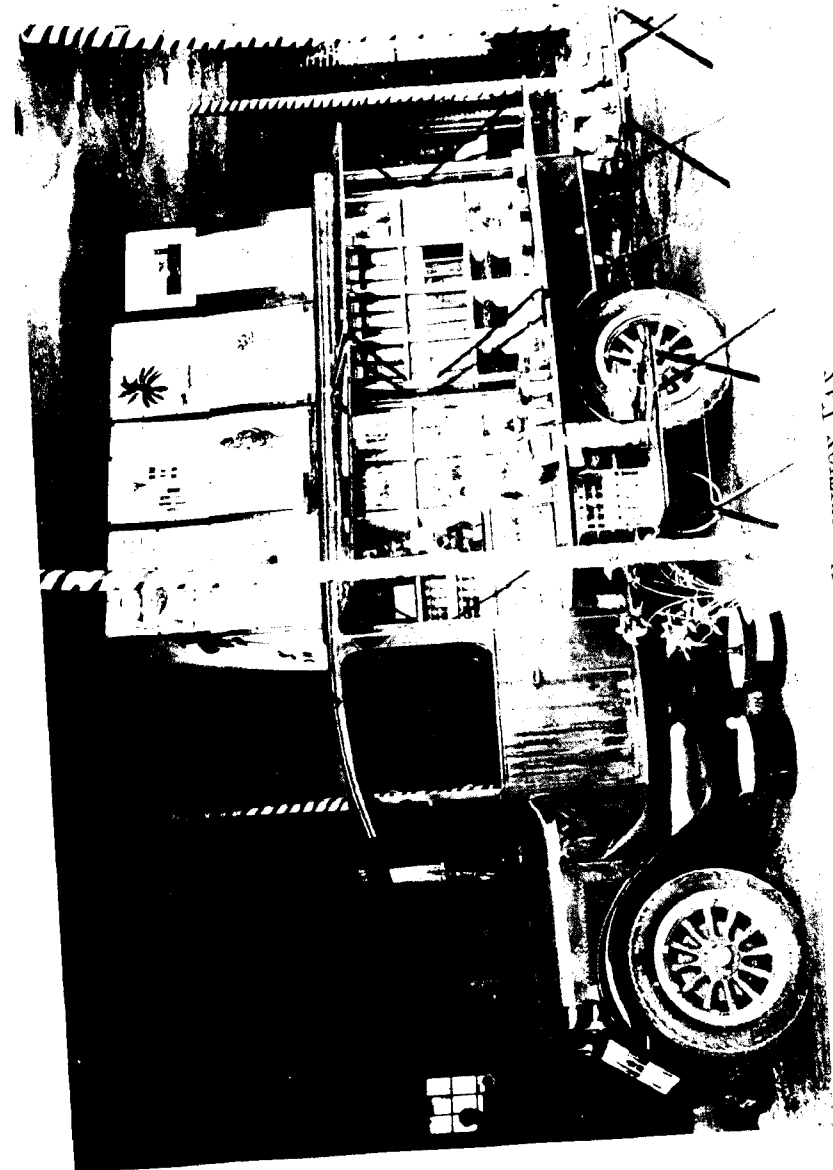
192. Yet another notable exhibition was held at Srirangam where a ryots' conference was held under the auspices of the Uyyakondan Mirasidars' Association. This conference was opened by the Hon'ble the Minister for Development and presided over by Janab Khan Bahadur P. Kalifulla Sahib Bahadur, M.A., M.L.

193. The usual ryots' conference was held at the Aduturai Paddy Breeding Station in January and was well attended. This again was opened by the Hon'ble the Minister for Development and presided over by D. H. Boulton, Esq., the Collector of Tanjore.

In all, 185 agricultural exhibitions great and small were staged by the department during the year.

194. *Exhibition motor vans.*—The propaganda work of the department received a considerable impetus during the year with the advent of a motor unit consisting of an exhibition car and a caravan. This unit was inspected by His Excellency the Governor at Coimbatore on 9th July and was then put on the road. After a few short preliminary trips, it started on a tour of 23 days' duration of all the important villages in the northern half of Coimbatore district. After this, it toured the rest of the Coimbatore district for a month. It then paid a visit to Malabar and was taken as far as Calicut. It was not considered safe to trust the cars on the ferries, so they could not proceed further north. On this trip, they visited 68 villages.

195. From there, the unit returned to Coimbatore and moved in the Salem district visiting all taluks with one exception. It then proceeded to Madras where it first visited North Arcot and Chingleput districts and was then on show during the fair and health exhibition and also at the Indian Science Congress and the Legislative Council Chamber. After attending the



THE MOTOR EXHIBITION VAN.

North Arcot Co-operative Conference at Vellore, the Self-respect Conference at Chingleput, and festivals at Ponnai and Tiruttani, it made a regular tour of seven taluks of North Arcot, six taluks of Chingleput, and one taluk of the Chittoor districts.

196. The itinerary of the van is published in advance in district gazettes and by beat of tom-tom in the villages. Attendance was invariably good and the interest raised in the exhibits was followed by discussion and lantern lectures. There can be no doubt that much useful propaganda has been done with the aid of the van.

197. A second unit was constructed at the end of the financial year and a third is provided for in the budget for the coming year. One of these new units will tour in the north of the Presidency while another, the cost of which has been generously provided by a gentleman in Tanjore, will be devoted to the needs of Tanjore, Trichinopoly, Madura, and Tinnevely districts.

198. *Co-operation*.—From time to time a great deal is heard about the necessity for the Agricultural Department and the Co-operative Department to work together, but there is a good deal of confusion and misunderstanding among some people as to the duties and functions of the two departments. I would commend an article dealing with this question by Mr. A. P. Cliff, which appeared in the *Agricultural Journal of India* for March 1929 (xxiv. 2).

199. He points out that while both departments have the same object, the improvement of the condition of the masses of the people, they are really very distinct and separate agencies and that unless this is realized and their definite spheres of activity clearly demarcated there is a great danger of waste of effort and material resources.

200. The functions of the Agricultural Department are to find and test rigidly improvements, to demonstrate these improvements sufficiently, to create a demand for them from the cultivators, and lastly, to maintain a reserve of certain improvements such as pure seed supply. The Co-operative Department has equally definite functions among which is the provision of cheap credit to masses.

201. When the Agricultural Department has introduced any particular agricultural improvement and demonstrated it till the ryots have learned its value and there is a demand for it, it has completed its task and at this point the Co-operative Department should begin to function to foster this demand, to arrange for supplies to meet it, and to finance those supplies.

202. Take for example the case of an improved strain of seed. The Agricultural Department having evolved this, demonstrated its value to the ryots and created a demand for it, have fulfilled their function and it is not part of their work to supply this demand. The wealthier cultivators can buy the seed either from the Agricultural Department or from those who have grown it before, but the poor ones cannot do so and it is at this stage where the Co-operative Department should step in, and arrange for the supply of seed on credit to those poor ryots and also for supplies of seed to meet the general demand. The same principle applies to the supply on credit of improved implements and manures.

203. There is a definite stage at which the work passes from organized demonstration to organized supply with, in the case of the large bulk of the ryots, the necessity of financing that supply, that is to say, when the work passes from one department to the other.

204. The Royal Commission on Agriculture in India in their report (paragraph 143, page 158) say, "There would appear to be no organizations better fitted to further the propagandist work of the agricultural departments than co-operative unions and societies for the joint purchase of the requirements of their members, for production and sale either singly or in combination for the sale and hire of implements and similar objects."

205. The Commission blames the Agricultural Department for having failed to exploit the possibilities offered by the co-operative movement for propaganda work and consider that they should make far greater use of co-operative credit societies in their propaganda work. The agricultural departments are inclined to reverse this opinion and blame the

co-operative departments for having failed to exploit the possibilities offered by their propaganda and demonstrational work. Mutual recriminations are, of course, valueless and to be avoided and it is fully recognized in this Presidency by the heads of the two departments that their departments must work together as closely as possible.

206. The Bellary Sale and Loan Society was helped by a demonstrator to grade their cotton. This society sold 392 bales, valued at Rs. 77,000, and also 101,836 lb. H-1 departmental seed. A sale and loan society was started at Adōni, the chief cotton market in the Westerns area. This society sold 88 candies of lint, most of which belonged to our seed farm ryots. These societies took up a great deal of time of the local agricultural officers, and though this is not strictly speaking their legitimate function it is found necessary to afford this help. As the societies get on their feet, however, they should make arrangements to relieve agricultural officers of these duties.

207. The Cotton Sale Society at Koilpatti continued to do good work and a branch society at Puliampatti was started during the year.

208. In the Tanjore-Trichinopoly delta, considerable progress has been made with better farming co-operative societies of which two new ones were started during the year, and of which eight now exist. These societies maintain small demonstration farms under the direct supervision of a departmental officer to show to the public the efficacy of the cultural and manurial improvements advocated by the Agricultural Department and also produce seed for distribution to their members. Some of them serve also as agents for the sale of manures and implements. The senior society at Lalgudi has been in existence for four years and has now a membership of 99, a share capital of Rs. 1,180, and a reserve fund of Rs. 2,500. Although it pays a very high rate of lease on its demonstration farm in the form of grain it this year averaged a clear profit of Rs. 42 per acre on the first crop and Rs. 26 on the second crop by the use of departmental methods. The society proposes in the coming year to expand its activities to include dry and garden land crops and it has recently purchased a breeding bull for the benefit

of its members. Such societies are undoubtedly doing very good work and they are of great help to the department with their propaganda and attempts are being made to form similar societies in other districts.

209. *Criminal settlements.*—The four criminal settlements in the II Circle were visited regularly by agricultural officers during the year and advice was freely given as to the agricultural improvements which could be carried out, and green-manure crops and improved strains of paddy were introduced. As has been stated in former reports, however, very little can be done by this department for these settlements where money is very limited and where the problems to be solved are mainly horticultural and the finding of employment for their inmates rather than those of practical farming.

210. *Other settlements.*—Special advice was given by the department to the Ādi-Drāvida Settlement at Perundurai which is financed by the Co-operative Department. At our suggestion, the areas allotted to individual settlers were increased and well sinking is being done. The Agricultural Department also supplied the Settlement with a breeding bull and gave them a premium to help to maintain it.

211. The village of Elur in the Rāsipuram taluk of the Salem district was also visited in connexion with a scheme evolved to show what can be done to improve an Indian village if all the development departments combine. We have arranged to take our share in this somewhat unique experiment by demonstrating a number of agricultural improvements, but the water facilities of the village must be improved if we are to have much success.

212. *Seed supply.*—The ryots have learned the advantages which accrue from the use of the improved strains of various crops evolved by the department, but this success has brought in its train a very difficult problem, viz., the question of seed supply to meet the popular demand. As the Royal Commission on Agriculture in India say in their report, "In no respect is the difference between agricultural conditions in India and in western countries more marked than in regard to seed distribution. In most European

countries, in the British Dominions, and in the United States, the distribution of new varieties of proved value is the work of private agency. After the preliminary stage of testing has been completed and a variety has established itself in commerce the State takes no active part in it." In fact, the production and distribution of seed is not really the legitimate duty of the Agricultural Department. In this country, however, seedsmen do not exist, and the department would welcome any honest enterprise of this sort. For a very long time to come probably seed distribution must continue to be a burden on the Agricultural Department though it is becoming an unduly heavy one. To quote the Royal Commission again, "An increasing interest in the distribution of seed on the part of large landholders may assist them in some provinces, but there can be no doubt that the agency which offers the best prospect of materially lightening the load borne by the agricultural departments in this respect is the co-operative movement."

213. In this Presidency, advantage has been taken as far as possible of both these agencies to aid with seed multiplication and distribution. Co-operative societies have been formed, especially in the case of cotton as will be described below, to produce seed and co-operative societies formed to demonstrate better farming of paddy also aid by producing seed.

214. The problem, however, will never be solved satisfactorily until the ryots have been taught to grow their own seed and the importance of purity and the need for pure stocks. All the other methods which are now being used, welcome as they may be, are merely a compromise to tide over the period until the ryot has been taught to supply his own needs.

215. The problem is most pressing in the case of paddy, cotton, sugarcane, and green manures, but it is also rapidly assuming magnitude with all crops, and when the millet breeding station begins, as it will very soon do now, to put out new strains the problem will be greatly aggravated. The magnitude of the problem may be judged from the following table which shows the quantities of seed distributed during the year under review by the department itself.

This excludes the seed distributed by subsidiary agencies mentioned above.

Paddy	...	...	...	1587 tons.
Cotton seed	...	...	...	4404 „
Sugarcane	...	...	...	434,830 setts.
Green manure seed	...	...	...	106 tons.
Millet seed	...	...	...	10 „
Fodder grasses	...	...	...	27,550 slips.
Fruit trees	...	...	...	2,322 plants.
Plantains	...	...	...	1,883 suckers.
Potatoes	...	...	...	1285 tons.
Pepper	...	...	...	100,000 cuttings.
Pineapples	...	...	...	20,000 suckers.
Coconuts	...	...	...	12,719 seedlings.
				4,016 nuts.

D.—CROPS.

(a) Paddy.

216. *Reduction of seed-rate and economic planting.*—As a result of years of steady propaganda, a general reduction in seed-rate has been brought about all over the Presidency, and in recent years this improvement has become so general that it is impossible to keep any account of the acreage over which it has been adopted. The same applies to economic transplanting and there is no doubt that the area under these two improvements is increasing every year.

217. In the Tanjore delta the optimum seed-rate is probably 40 to 60 lb. per acre for the first crop and 30 lb. for *samba*. Though this optimum is not attained by all the seed rate has been generally reduced over very wide areas.

218. *Introduction of new varieties.*—New strains evolved on the Paddy Breeding Stations are in increasing demand each year and it is impossible for the department to meet the full demand for seed though attempts are being made to do so by every means in our power. The ryots have learned the value of these strains and they clamour for seed.

219. In the I Circle, the ryots produced and distributed among themselves under departmental supervision 593,994 lb. of seed of improved strains as compared with 221,623 lb. last year, while the sales from our own depots increased from 29,923 lb. to 63,584 lb. These

figures are a measure of the appreciation of our improved strains.

220. In the II Circle, G.E.B. 24 and Co. 3 are the most popular of the new strains, but several others have been introduced and Co. 5 is very promising. It is estimated that there are 1,466 acres under improved strains in this Circle.

221. In the III Circle, G.E.B. 24 is becoming popular as this year there were 4,317 acres under this strain.

222. In the IV Circle, the most popular of the new varieties is Co. 2 which is suitable for a late *samba* season. G.E.B. 24 is also a favourite and some 4,000 acres were planted with it. During the year, 44,247 lb. of seed of different varieties were distributed departmentally sufficient to sow 1,965 acres.

223. In the V Circle, the paddy breeding station at Aduturai has evolved improved strains of all the more extensively cultivated varieties of paddy and these have become very popular with the ryots and it is estimated that 109,237 acres are now cultivated with these strains. This represents about 17 per cent of the total cultivable wet land under this crop. To supply seed for this large area has taxed the resources of the department to the utmost. Seed is obtained by means of the departmental seed farms, through co-operative societies formed for the special purpose, through seed unions, and by inducing selected ryots to grow seed for distribution. As a result of these organizations, 2,313,519 lb. of seed were obtained and distributed and in the coming year arrangements have been made to produce 3,869,698 lb. of seed.

224. In the VI Circle, preliminary trials have shown that the following improved strains can be grown successfully and yield better than existing varieties, G.E. B. 24, Co. 1, Co. 2, Co. 3, and A. E. B. 65. It is estimated that there are now 6,056 acres under these strains. Seed farms have been started on 38.77 acres to meet the growing demand for seed.

225. In the VIII Circle, there is an increasing demand for G.E.B. 24 and the Co. varieties and 21,722 lb. of seed of these strains was distributed. Nine thousand acres is a modest estimate of the area under improved strains in this Circle.

226. It is impossible to say how many acres are now under improved strains, but a very rough and incomplete estimate is 215,851 acres.

(b) *Sugarcane.*

227. The all-round qualities of J. 247 and propaganda work in connexion with it has made this cane increasingly popular. The sugarcane testing station at Anakapalle supplied 114,630 lb. of setts to ryots and in the I Circle the area under this cane has increased to more than 1,500 acres during the year. By means of a series of successful demonstrations the ryots have been made to realize the advantages of line planting and proper spacing of setts as compared with broadcasting and there is now a considerable acreage under this cultural improvement.

228. At Hospet in the Bellary district attempts have been made to demonstrate better methods of both growing cane and making *jaggery*. These attempts, it must be admitted, have not yet met with much success, because the ryots cultivate with capital borrowed from *jaggery* dealers and the manufacture is done with outside labour. It is very difficult to compete with these conditions, but we propose to persist in our efforts.

229. In the IV Circle, the area under improved varieties of cane has risen during the year from 2,400 acres to 5,100 acres. This is mainly in South Arcot where the local canes are rapidly being replaced by J. 247 and Fiji B. The use of *Sindewah* furnaces has now become a regular practice in Chittoor and North Arcot and all the assistance needed by the ryots is the occasional correction in faulty construction. This improvement is now being carried into the South Arcot and Chingleput districts where some 150 furnaces were constructed and demonstrated during the year.

230. In the V Circle, sugarcane is grown on a very limited area, but there are now 63 acres under improved varieties as compared with 2 acres in 1922 and the major portion of this was line planted.

231. In all there are probably some 10,000 acres under improved strains in the Presidency.

(c) *Cotton.*

232. The demonstrational work done with this crop is the distribution of improved varieties evolved at the cotton breeding stations, arrangement for supplies of pure seed, improved method of cultivation by means of line sowing and intercultivation, and early sowing, and the proper use of manures.

233. There is a large and ever-growing demand for seed of the departmental strains and difficulty of meeting it lies in the fact that the ryot is apt to lose his own seed by selling his produce as *kapas*. This is mixed in the ginneries and seed obtained from that source is very apt to be impure.

234. *Seed societies.*—The seed farm ryots in the Coimbatore Circle have now been grouped into seed societies registered as non-credit societies under the Indian Co-operative Act with suitably amended by-laws. There are now ten of these societies, containing 170 members and representing 1,126 acres. All the *kapas* produced is handed over to the Agricultural Department for ginning, the lint is auctioned to the best advantage, and the seed is bought by the department at Rs. 2 per *pothi* above the market rate. The distribution of the seed is thus in the hands of the Agricultural Department. It has now been proposed that the management of the six societies which belong to the Avanashi Union should vest in this union with a special Agricultural Demonstrator in charge of the work under the Deputy Registrar so that still more intensive work may be carried on. This is in the nature of an experiment and the effect will be to transfer the responsibility for the work to the Co-operative Department and the societies and unions will have to play a greater part in the production and distribution of pure seed than they have done hitherto.

235. *Seed farms.*—The system of seed farms which is adopted by the department to deal with the problem of producing large quantities of pure cotton seed for future distribution to the ryots has been explained in detail in former reports. In the Coimbatore Circle, a change was introduced this year. Hitherto seed was issued free to seed farms, but this year the seed issued was recovered at the end of the season. The acreage

under cambodia seed farms in this Circle was 1,126 acres during the year. This included 119 acres under the new strain Co. 2 which in the coming year is to replace the old departmental strain No. 295. Advances were made for 1,076 acres, the ryots cultivating the other 50 acres did so without advances, a most encouraging sign. The yield will, due to unfavourable climatic conditions, be on the low side.

236. During 1927-28, from 1,005 acres of seed farms under cambodia 473,065 lb. of *kapas* were brought to the gins. This yielded 294,437 lb. of seed which was purchased at a premium. The lint was finally sold at auction at Rs. 255 per candy, Rs. 10 premium on the market rate at the time. A higher price was offered at the first auctions, but unfortunately the ryots decided to hold and thereby they lost money as the market fell and did not rise again.

237. In 1927-28, there were 670 acres of seed farms under *karunganni* cotton which gave 197,038 lb. of *kapas* and 126,328 lb. of seed was bought at a premium. In the current year, 699 acres were placed under this variety on seed farms. The yields in this case will also be low.

238. During the season with the help of seed from these farms and from other agencies 294,475 lb. of cambodia seed and 128,546 lb. of *karunganni* seed were distributed for sowing in the Circle. This was sufficient to sow 22,063 acres. The total area under improved strains was, however, considerably more than this as many ryots and merchants held stocks of seed grown from departmental strains. These transactions resulted in a profit to Government of Rs. 2,528-9-0.

239. In strain Co. 2, which used to be called No. 440, the department has evolved an exceedingly vigorous cambodia cotton able to withstand disease and giving on an average 185 lb. of *kapas* per acre more than the old strains or an increase of 25 per cent. The staple length is $1\frac{1}{8}$ inch and it is suitable for the highest standard warp counts of 34s. Graders value above or below contract rate was Rs. 90 on a basis of Rs. 355. As already stated, it is proposed to replace other varieties by this strain in the coming year.

240. In the VI Circle, no new strains were available from the Kovilpatti station so 783 acres were laid down under seed farms in 1927-28 with the two varieties now used, and 98,411 lb. of seed were distributed.

241. To meet the increasing demand for seed, the area under *karunganni* seed farms was extended this year to 1,005 acres, but the season having been bad, the yield will be below normal. Departmental strains in varying degrees of purity are universally cultivated in this circle and *uppan* cotton which was formerly grown pure in the Rāmnād district now forms only a small percentage in mixtures with *karunganni*.

242. *Cambodia*.—The cultivation of cambodia cotton in this Circle is confined to the Madura district and the western taluks of Rāmnād. Seed was formerly obtained from the VIII Circle, but this year 105 acres have been laid down to seed farms and it is intended ultimately to make the district self-supporting. This year, 19,900 lb. of seed were distributed.

243. *Pulichai*.—The prevalence of this low grade cotton has been reported from several villages near Virudunagar. *Pulichai kapas* finds favour with dealers on account of its high ginning percentage and in mixed lint it is difficult to detect, so that a small percentage of *pulichai* does not affect the price to any extent. Propaganda against this cotton is carried on by the department, but unless buyers themselves take concerted action and refuse to buy cotton containing *pulichai* little can be done by propaganda methods.

244. *H. 1*.—This strain of cotton which was evolved at the Hagari Experiment Station is popular in the westerns area of the Bellary Circle. Last year, it fetched a premium of Rs. 20 per candy and to meet the demand for seed the area under seed farms was increased to 7,576 acres from 4,311 acres last year, and 333,326 lb. of seed were distributed. Thirty-six thousand one hundred and ninety-six acres were sown with departmental seed, while the natural spread is estimated to be 12,426 acres.

245. *H. 25*.—This strain is being replaced by *H. 1* which is a better strain, but it is still extensively grown in the Bellary district where there were 121,374 acres.

246. N. 14.—This strain evolved on the Nandyal Experiment Station is not very popular, because its success depends largely on soil and climatic conditions, but it fetches a high price. Last year, the season was favourable for the strain, and in consequence the area sown with it increased this year to 21,401 acres. The crop was fair and the lint fetched a premium of Rs. 40 per candy. In order to obtain a supply of pure seed for future sowings, 2,200 acres have been established under seed farms.

247. Cotton is a crop of minor importance in the V Circle where it is restricted to the Trichinopoly district, but 12,276 lb. of cambodia seed were distributed departmentally while an additional 44,000 lb. were obtained from other sources. This was sufficient to sow 5,600 acres of which 178 were line planted.

248. The following figures indicate the steady increase of work which has been done with this important crop during the last five years. It is estimated that there are now at least 350,000 acres under improved strains of cotton evolved by the department and this is probably on the low side.

Circle.	Variety.	Area of seed farms in acres.				
		1924-25.	1925-26.	1926-27.	1927-28.	1928-29.
(1)	(2)	(3)	(4)	(5)	(6)	(7)
VIII	Cambodia ...	963	1,151	1,047	1,005	1,126
	Karunganni...	...	813	926	850	699
III	H.-1 ...	...	...	1,068	4,311	7,576
	H.-25 ...	...	...	...	...	...
	N.-14 ...	...	...	...	...	2,200
	M.-247 ...	...	...	...	...	...
	Kumpta ...	...	...	...	...	...
VI	Karunganni ..	355	318	429	782	1,005
	Cambodia ...	...	...	...	...	...
	Total ...	1,318	2,282	3,470	6,948	12,606

Circle.	Variety.	Seed distributed in lb.				
		1924-25.	1925-26.	1926-27.	1927-28.	1928-29.
		(8)	(9)	(10)	(11)	(12)
VIII	Cambodia ...	245,090	219,500	311,182	375,623	294,475
III	Karunganni...	21,250	51,908	95,379	107,018	128,545
	H.-1 ...	...	...	...	...	333,326
	H.-25 ...	111,327	136,285	232,364	72,433	...
	N.-14 ...	112,000	78,400	119,200	89,402	94,792
	M.-247 ...	...	...	...	...	...
VI	Kumpta ...	...	...	...	378,750	...
	Karunganni...	63,175	61,080	47,721	80,508	98,411
	Cambodia ...	...	...	...	...	19,900
	Total ...	552,842	547,173	805,846	1,103,734	969,449

Circle.	Variety.	Total area sown in acres.				
		1924-25.	1925-26.	1926-27.	1927-28.	1928-29.
		(13)	(14)	(15)	(16)	(17)
VIII	Cambodia ...	12,255	10,975	15,554	17,781	22,063
III	Karunganni...	1,062	5,190	4,764	5,351	
	H.-1 ...	...	45	1,068	6,453	48,622
	H.-25 ...	179,569	167,963	154,906	129,453	121,374
	N.-14 ...	20,180	12,300	17,730	11,000	21,401
	M.-247 ...	...	...	356	540	400
VI	Kumpta ...	...	...	...	40,000	...
	Karunganni...	6,318	6,108	4,700	8,051	45,641
	Cambodia ...	...	...	...	...	682
	Total ...	219,384	202,581	199,078	218,629	260,183

249. *Sowing*.—Concurrently with the distribution of seed of improved strains, better methods of cultivation are demonstrated and taught. One of the most important of these is line and drill sowing. It is difficult to make the ryots take to this and constant efforts are needed to maintain it. In the VI Circle, 16,143 acres were drill sown which is a reduction on last year. In the Coimbatore, VIII Circle, 527 acres were drill sown. Here the system does not find favour with the ryots owing to the difficulty of giving the crop a sprout irrigation. To get over this difficulty, it is proposed to lay out the fields in ridges and furrows before sowing and to dibble in the seed by hand and suitable implements are being designed for this purpose.

250. It was reported last year that early sowing had been found an advantage and that this would be demonstrated. The results of this demonstration were somewhat disappointing, as the crops were badly attacked by insects especially shoot-borer. If the full benefits of early sowing are to be obtained, fairly large blocks must be thus sown in one area. In Bhavani, the early sown crops escaped insect attack for some reason and here up to the present they have given 900 lb. of *kapas* per acre against only 100 lb. for the late sown cotton showing what early sowing is capable of doing under favourable circumstances.

(d) *Coconuts.*

251. The demonstration work with coconuts to show the West Coast ryots that this crop can be grown successfully under a system of dry farming was continued. Two hundred and ninety-eight old demonstration plots were maintained and seventy-three new ones were started and these form a chain throughout the length and breadth of the Circle. The system is now being widely adopted as a result of this propaganda and several thousands of acres of old gardens were improved and more than 10,000 acres have been planted. There is an increasing demand for seedlings which was partially met by the establishment of special nurseries. This year, 12,719 seedlings and 2,716 nuts were sold. During the last four years the department have supplied 27,646 seedlings and 38,776 seed nuts to ryots. On some of the demonstration plots where the plants are six to seven years old they have begun to flower and fruit.

252. Cultural experiments and manures have also been introduced into V Circle where 156 acres were intercultivated during the year and over 2,000 trees were manured. One thousand three hundred selected seed nuts were obtained from the West Coast and distributed.

(e) *Potatoes and fruit.*

253. As a result of research work on the potato experiment station at Nanjanad and on the fruit experiment stations the department is now in a position to actually demonstrate to the cultivators on the

Nilgiris and other hills a number of improved methods of cultivation were they placed in a position to do so. The time has come to convert the Nilgiris into a properly organized circle with an adequate staff of demonstrators to cope with this work. Government, I understand, consider the proposal as premature, but in view of the fact that we have accumulated the necessary knowledge and that work is being taken up among the Badagas and Todas by private agencies who look to the Agricultural Department for help which they cannot give under the present conditions this can hardly be the case. At present, there is only one Agricultural Demonstrator to deal with the work on the hills. It is estimated that there are 9,158 acres under improved varieties of potatoes imported and tested by the department. The demand for seed increases year by year and it is met to some extent by seed farms under our control and 1,018 maunds of seed was distributed. The cultivation of potatoes should be rotated with some cereal such as wheat or "samai" which has been introduced recently. There is also a fair possibility of growing barley to meet the requirements of the Nilgiri Brewery. The United Breweries Co., Ltd., have made some experiments with barley and have introduced seed of good malting varieties, and they are prepared to buy all we can produce at a fair price and can supply seed sufficient to sow 50 acres. This is an industry which should be developed on these lines.

254. With reference to fruit, a fairly wide range has now been proved capable of bearing profitably under Nilgiri conditions and stock can be supplied. There is no difficulty in disposing of the produce locally and there is undoubtedly scope for supplying the demand in Madras and other large towns if the cottage industry was developed. That there is a demand for expansion is indicated by the fact that during the year 499 grafted fruit trees and 750 fruit seedlings were sold from the Coonoor nurseries as compared with 346 and 573 respectively last year, and 794 from the Kallar nurseries as compared with 291 last year.

255. On the West Coast, the experimental orchard at the Taliparamba Experiment Station, small as it is,

has given a stimulus to fruit growing. Twenty thousand pine apple suckers and 279 other fruit plants were sold to ryots during the year.

256. *Plantains*.—Demonstrations of improved methods of cultivating this crop were given in the I and II circles which have impressed the ryots.

(f) *Dry grains.*

257. There is a real demand for a good dry land *ragi* in the Salem district, and Kollegal taluk and 1,487 lb. of H.-22 seed, a strain evolved by the Mysore Agricultural Department, was distributed. In the Hosur taluk, this variety has spread over 2,000 acres. A new strain evolved by the Millets Specialist is to be tried out on the garden lands of Coimbatore under which conditions H.-22 does not do so well.

258. In the III Circle, a strain of *ragi* evolved at the Hagari Experiment Station, known as T. 8, is making progress and there are now 2,143 acres under it. This strain will shortly be replaced by another still better strain evolved by the Millets Specialist. A strain of yellow *jonna*, T. 6, evolved at the Nandyal Experiment Station and suited to the Kurnool and Cuddapah districts occupied 10,165 acres.

259. There are now probably about 15,000 acres of different millets already under improved strains in the Presidency.

(g) *Groundnuts.*

260. Groundnuts continue to increase in popularity as a dry crop and have in some areas replaced cotton to some extent. The total area in the Presidency under this crop during the year was the highest ever reached, viz., 3,336,536 acres. The biggest areas lie in South and North Arcot, 453,282 and 460,984 acres respectively, followed by Kurnool and Anantapur with 423,664 and 349,455 acres. As a result of this, waste lands are being brought under cultivation and dry lands are becoming more valuable. The erect variety is gaining popularity owing not only to its high yield, but also to its shorter growing period and the ease with which it can be harvested. On wet lands, it can precede paddy as a first crop.

261. In the V Circle, the bunch variety introduced from Palur is becoming popular and 300 acres were sown behind the plough instead of being broadcasted.

(h) *Silage.*

262. Silage making was successfully demonstrated in a number of places and a variety of materials have been used such as *ragi* straw, *cholam* straw, sunnhemp, grass, etc.

263. Silage made from young *spear* grass at the Hosur Central Cattle Farm last year was found to be rather dry and experiments are now being tried to improve its quality by cutting in the early morning and covering the pits while in process of filling. Two hundred and eighty-two tons of silage were made on this farm out of *cholam*, *spear* grass, cow-pea, and *kolukkatai* grass.

264. On the West Coast 25 demonstrations were given with silage prepared from hill grasses. The results were generally good.

265. On many of our Experiment Stations silage is made and used as a matter of routine and we depend upon it for feeding our animals during the dry weather. The following quantities were laid down during the year :—

	LB.
Chintaladevi Ongole Farm	181,500
Guntur Buffalo Farm	15,263
Taliparamba Experiment Station	19,400 (grass).
Taliparamba Agricultural Middle School.	24,344
Hagari Experiment Station	61,912
Guntur Experiment Station	26,910 (jonna).
Paddy Breeding Station, Pattambi	33,608 (grass).

266. Excellent silage was prepared on the Kovilpatti Experiment Station from a mixture of *irungu* and *periamanjil cholam* and *cumbu* after being pitted for four months.

267. Experiments have been tried in various places to test the usefulness of weeds and other material for silage. Thus at the Government Gardens, Ootacamund, a pit was filled with equal quantities of grass and *Polygonum molle*, a troublesome weed on the hills. The result was quite satisfactory and the resulting silage relished by the cattle. At the Nanjanad

Potato Experiment Station, silage was made of *samai* straw with success. This is a new cereal crop which has been introduced on the hills to grow in rotation with potatoes.

E.—AGRICULTURAL IMPLEMENTS.

268. The feature of the year under report has been the appointment of a Research Engineer. In August 1928, Mr. N. G. Charley, B.E., assumed his duties. The main function of the section which he commands is to carry out research on mechanical farm equipment both for the benefit of the cultivators who use machines and implements and of those who manufacture them. The latter have given us their whole-hearted co-operation and a large number of implements and machines have been sent us for trial and test.

269. It is the policy of the department to endeavour to improve existing implements rather than to introduce new designs of which the ryot is always shy, but the ultimate possibility of the latter when it is really necessary and no machine exists for some particular purpose will not be lost sight of. It will be noted that both the organization of this new section and the policy briefly outlined above is in conformity with the recommendations of the Royal Commission on Agriculture in India as laid down in paragraphs 106 and 107 of their Report.

270. Despite the lack of adequate and subordinate staff and workshop equipment, Mr. Charley has made very excellent progress during the short time he has been at work and it is to be hoped that this new section will be developed during the near future as it is undoubtedly capable of producing results of great benefit to the ryots.

271. *Ploughs.*—A large number of ploughs of different types have been received from the makers or agents and have been tested. The object is to select a range of styles most suitable for the range of soils and the kind of ploughing met with in the Presidency rather than to attempt the impossible task of finding a plough which will suit all our varying conditions. We shall then be in a position to advise the ryot which type of plough will best suit his particular conditions

and give him the most economical service. Great attention has been paid to the wearing qualities of plough parts. Plough makers in India should realize that there is no real economy in cheap ploughs in which low grade material such as mild steel or wrought iron is used for the working parts, and such implements will do more harm than good and tend to make the iron plough unpopular. The task of selecting ploughs is rendered difficult by price considerations. The more expensive plough will generally prove the more economical purchase by virtue of better quality, but the prices of many of the ploughs at present available in India have little relation to their real values. This position will only improve with the increasing demand for iron ploughs by the ryots and keener competition among manufacturers to supply these demands. There are already several makers who are offering implements which fully meet the requirements at prices which may be regarded as setting a fair standard of implement value, and such firms are performing a great service to Indian agriculture.

272. The best method of supplying ploughs and other implements to the ryots has not yet been discovered. Hitherto, it has been the practice in this Presidency for the department to obtain them from the supplying firms on credit account and to stock them in their depots for sale to the ryots. This system has been found unsatisfactory for several reasons, and it involved departmental officers in account troubles and gave them a lot of extra work. Arrangements were made this year to hand over the supply to firms who already have a wide organization of depots for supplying manures to the ryots. This change has caused a certain amount of delay and perhaps a reduction in sales, but it is now complete and this defect will disappear and it is hoped that in the coming year the ryots will find it easy to obtain what they want. The departmental officers will be able to concentrate their efforts on the demonstration of the types advocated. A very large number of such demonstrations have been given, in fact this forms an essential part of the work of every Agricultural demonstrator. The sale of ploughs by departmental

agency will in future disappear under the new arrangements, but during the year a total of 2,054 ploughs and 3,946 spare parts were sold by the department.

273. *Cane-crushing mills*.—A number of three roller bullock power cane-crushing mills were tested by the Research Engineer during the year and three types have been selected as suitable to the needs of the ryots in this Presidency. There is, however, still scope for improvement in design of these mills and the attention of the makers has been called to this. The price of these mills is rather high for the small ryot and this limits their sale and use, but 25 mills were sold departmentally during the year. The manufacturers of certain local mills who have long been known in the Circars hired out their mills on contract for three to three and a half months at Rs. 25 to Rs. 30 and attended to all repairs and replacements free of cost. This is a welcome system which suits the cultivator admirably, but it has of course reduced actual sales.

274. *Water lifts*.—There seems to be little possibility of greatly improving the methods now in use for lifting water by bullock power, but the *mhote* is capable of improvement in respect of the wheel, the bucket, the yoke, and the manner of the return of the bullocks to the top of the ramp. As regards the first, two improvements are being demonstrated in the employment of the roll-easy *mhote* wheel with roller bearings and a galvanized bucket and both are gradually becoming popular. The former gives a saving of eight per cent in power and though the price is rather high 224 have been sold departmentally during the year. Experiments are in hand with a new design of wheel which will be cheaper.

275. One of the most promising water-lifting devices for bullock power is the Persian wheel. The principle is sound, the capacity of the lift is greater than that of the *mhote*, and the power of the bullocks is applied in a comfortable and efficient manner. This type of lift is well worthy of attention and the possibility of improving existing makes will be investigated.

276. Engine-driven pumps will also receive the attention of this section and arrangements are being

made for the collection of data pertaining to running costs and costs of upkeep of various makes.

277. The prospects of windmill pumping in this Presidency are also being investigated and a mill of a modern type has been obtained from Australia, where they are very largely used, and erected at Coimbatore for experimental purposes.

278. *Chaff-cutters*.—Samples of circular hand power chaff-cutters have been received for trial from several firms. These implements, which lead to a great economy in the use of fodder, are beginning to meet with the attention of ryots as a result of persistent demonstration at exhibitions and 29 were sold departmentally during the year.

279. *Drills*.—There is a great need in this Presidency for a cheap and efficient form of automatic drill. Line planting and drill sowing to aid efficiency in after cultivation of crops like cotton and millets is being demonstrated widely by the department, but the need of a really good drill is badly felt. It was, therefore, considered that in this instance a new design was called for and not a mere improvement of the country drill. The Research Engineer has designed and made a drill which is still under test, but is likely to become a standard implement. At the same time, the merits of the indigenous *gorru* has not been overlooked and experiments with a simple mechanically operated seeding element for attachment to this implement are being conducted. A pitting implement for the purpose of sinking small circular holes for bamboo props in sugarcane fields has also been designed. Other implements studied include a new design of *guntaka*, a cultivator, and a subsoiler, and these are still under investigation.

F.—MANURES.

(a) *Green manures*.

280. It is becoming increasingly difficult to cope with the large demand for green manure seeds all over the Presidency and so rapidly has this improvement spread that it is impossible to say how many acres are now under green manures of one sort and another, but it cannot be less than 100,000 acres.



NEW SEED DRILL, DESIGNED BY THE RESEARCH ENGINEER.

281. In the I Circle, it is difficult to get water for raising green manure crops in the central delta. Despite this, the area under such crops was raised from 500 to 600 acres in the Nidadavole district, from 391 to 472 acres in the Bhīmavaram district, and 235 to 755 acres in the Vizagapatam and Ganjām districts.

282. In the II Circle, *kolinji* is the most popular green dressing and the area under this is only limited by the seed supply. It is estimated that there are now 26,000 acres. In the saline acres *dhaincha* is used and there are 850 acres under this. Indigo and *pilipasarū* are also grown. There are 36,450 acres at least under one green dressing or another in this Circle.

283. In the III Circle, as a result of continued propaganda, green manuring has become a recognized practice in the taluks bordering the Tungabhadra and along the Cuddapah-Kurnool canal, and under the Cumbum and Markapur tanks. *Sunnhemp* is usually grown and *dhaincha* has been introduced on saline lands and it is estimated that there were 1,707 acres under the former.

284. In the V Circle, owing to the clayey nature of much of the delta soil green manures are of special importance, and their use is extending. During the year, 172,951 lb. of seed were distributed from departmental sources and by co-operative societies, sufficient to sow 12,850 acres.

285. In the VI Circle, the use of *kolinji*, *dhaincha*, and *sunnhemp* as green dressings is increasing and during the year 60,932 lb. of seed were sold and it is estimated that 1,594 acres are now under green dressing crops.

286. In the VIII Circle, 25,383 lb. of green manure seed were distributed and it is estimated that over 6,500 acres were sown without any departmental help.

(b) *Indigenous manures.*

287. Departmental propaganda on the proper conservation of cattle manure is continuously carried out. Progress in this direction is slow, but there is a distinct tendency for the ryots to store their manure

in pits instead of in heaps and the use of litter and dry earth to collect urine is on the increase.

288. The preparation of synthetic farm-yard manure from waste products like prickly-pear, waste straw, dry leaves, etc., was demonstrated far and wide, and this method is within the power of the ryots if a little care is taken.

289. The results of work on our Experiment Stations have placed us in a position to assert that under general conditions the use of bonemeal in conjunction with organic matter is the cheapest and best manure for paddy and this has been widely demonstrated.

290. In the IV Circle, oil-cakes are being increasingly used for paddy and sugarcane and attention has been paid to showing the ryots how to supplement these with artificials like sulphate of ammonia and superphosphate. It is estimated that during the year, 150 acres of paddy and 100 acres of cane were manured with oil-cakes. This is, of course, a very small area, but it nevertheless represents an advance since a few years ago this form of manure was ignored by the cultivator.

(c) *Artificial manures.*

291. During the last few years there has been a very marked increased production of nitrogenous fertilizers from the air in western countries and these products have found their way to India and have been placed on the market at prices well within the reach of the ryots in this Presidency. It is therefore important to obtain as much information as possible about these fertilizers and this has been recognized at Rothamsted and elsewhere. In "Agricultural Research in 1927," a publication issued by the Royal Agricultural Society of England it is remarked, "The publicity now given to research in the lay and technical press and the increasing application by the enlightened practical man of the bearing of research of science upon his practice whilst in the main operating beneficially for the improvement of practice

has imposed upon the agricultural adviser an increased responsibility for the safeguarding of the farmer against premature application of the discoveries of science to his practice and especially against the wiles of the commercial exploiter of the enhanced reputation of agricultural science".

292. Examples of this are not unknown in this Presidency and the wise farmer will be very much on his guard against the salesman talking "Science."

293. Supplying firms are apt to make exaggerated claims for their manures which they cannot hope to fulfil under average conditions. It is, of course, difficult to damp the ardour of enthusiastic propagandists, often with little or no scientific training, but in the long run trade will go to those who take care to see that the ryot is properly advised in the use of artificial manures and who give him a square deal. Ryots are always advised to consult the officers of the Agricultural Department before they buy any artificial manure.

294. The ryots in this Presidency have learned to use manures of all sorts in much greater quantities than they did in the past. This is undoubtedly due to the efforts of the Agricultural Department and the result of their propaganda work during the last 10 or 15 years as well as to the reduction in prices of artificial fertilizers and the facilities which have been placed at their disposal by supplying firms for obtaining such manures readily. Having thus taught the ryots the benefits to be obtained from the general use of manures the Agricultural Department is now turning its attention to the more difficult problem of seeing that they use the best possible manures of the many now on the market. The wide choice of these is apt to confuse the ryots and they naturally turn to the Department for advice on this question.

295. The Agricultural Department however is not in a position to give them a direct answer. In order to obtain this information a somewhat novel venture has been undertaken this year, namely, the establishment of a manurial experiment station in co-operation with supplying firms on which the merits of these

different fertilizers will be tested out side by side under the same conditions. A certain number of supplying firms have agreed to collaborate with the Department in this scheme and to pay their share of the cost and thus a subsidized experiment station has come into being. The first station of this sort has been started at Maruteru in the neighbourhood of the Paddy Breeding Station and it will deal with paddy only. The reasons for this choice are various, suitable land was available, the staff is in existence, the delta is fairly typical of paddy soils and the paddy ryots have adopted manuring more readily than others. It is hoped however when experience is gained to extend the idea and to establish similar stations in other parts of the Presidency to deal with other crops and with dry as well as wet land.

296. The primary object of this station is to answer a few simple questions such as out of the many artificial fertilizers now on the market which is the best to use and the most economical and how should it be used. Will the same result be obtained for a similar expenditure of money by using cakes? More complicated questions such as the rates of application, the frequency of application, the times of application of any particular fertilizer or combination of fertilizers have been relegated to a place of secondary importance for the present. If we can determine which of the many fertilizers, some of them quite new to India, are likely to give good results from an economic point of view these other questions can be dealt with later.

297. A very large number of demonstrations were arranged to show the ryots, how, when, and in what quantities artificial manures may be economically employed to improve the existing system of manuring and the importance of using them with bulky organic manures was specially emphasized. That the ryots are appreciating the results is shown by the actual sales of artificial manures made by the big distributing firms.

298. In the I Circle, though we have made no effort departmentally to introduce sulphate of ammonia and superphosphate as we still await proof at

Experiment Stations that this combination is suitable to the district, large sales have been made by propagandists, and some 85.5 tons of artificials have been purchased by the ryots.

299. In the II Circle also, extensive use has been made of artificial fertilisers, more especially for paddy, and it is estimated that the sales in this circle amounted to 1,349 tons of sulphate of ammonia and superphosphate and a total of 1,920 tons of artificials of all descriptions were used as well as 500 tons of cake.

300. In the III Circle the sale of artificials is limited by the precarious rainfall and the low purchasing power of the ryots, but some 2,111 tons were sold.

301. In the IV Circle there are numerous manure distributing agencies with a network of agents, sub-agents, and propagandists and very large quantities are being sold.

302. In the V Circle very rapid progress has been made and here special co-operative societies have been formed to demonstrate the proper use of artificial manures as well as to distribute them. It is estimated that 2,935 tons of artificial manures were purchased by ryots in this circle during the year.

303. In the VI Circle intensive propaganda has been carried out by commercial firms and by the department on the advantage of supplementing the limited quantity of organic manures available by the use of suitable artificials. The results have been satisfactory and the sales large.

304. In the VII Circle artificial manures must be used with caution owing to the high rainfall and the general lack of lime in the soils, but some 40 tons at least were used.

305. In the VIII Circle also these manures are being used with caution and some five tons only were sold.

VII.—PUBLICATIONS AND SUPPLY OF INFORMATION.

306. The undermentioned leaflets and bulletins were published during the year 1928-29 :—

Number.	Subject.	Author.	Languages in which published.	Number of copies printed.	Price.
	<i>Leaflets.</i>				RS. A. P.
49	Note to assist identification of karunganni and uppani cottons.	...	English ... Tamil ...	400 4,400	Free. Do.
50	The rice bug ...	Rao Sahib Y. Ramachandra Rao, Government Entomologist.	English ... Tamil ... Telugu ... Malayalam ... Kanarese ...	2,500 3,000 5,000 1,500 2,000	} Do.
51	Report on sugarcane.	S. Sundararaman, Government Mycologist.	English ... Tamil ... Telugu ... Malayalam ... Kanarese ...	1,600 10,100 4,100 4,100 2,300	
52	Points to note in preparing dry seed beds for paddy.	N. Sitaramaswami, Retired Agricultural Demonstrator, Samalkot.	English ... Tamil ... Telugu ... Malayalam ... Kanarese ...	2,000 5,000 10,000 2,000 2,000	} Do.
53	Training of practical cultivators, maistries or field coolies.		English ... Tamil ... Telugu ... Malayalam ... Kanarese ...	3,000 5,500 3,200 750 1,000	
54	Conditions to be fulfilled for the grant of Government premia for breeding bulls maintained by private bodies.		English ...	600	Do.
53	(Revised). Note on the exhibits at the Agricultural Exhibition, IV Circle.	...	English ... Tamil ...	2,500 6,000	} Do.
15	(Revised). Coconut stem-bleeding Disease.	S. Sundararaman, Government Mycologist.	English ... Tamil ... Telugu ... Malayalam ... Kanarese ...	1,600 10,100 4,100 4,100 2,300	
26	Treatment of Smut by copper sulphate (Reprint).	Subbannachar, Agricultural Demonstrator.	Telugu ...	5,000	Do.
	<i>Bulletins.</i>				
91	A soil survey of the Malabar District.	B. Viswanath and T. S. Ramasubrahmanyam.	English ...	500	1 6 0

Number.	Subject.	Author.	Languages in which published.	Number of copies printed.	Price.
	<i>Bulletins—cont.</i>				RS. A. P.
92	Mosaic disease of sugarcane.	S. Sundararaman.	English	1,000	0 6 0
93	Cultivation of Plantains on Wet Lands in the Godavari delta.	G. Jogi Raju	Do. Tamil Telugu	10,000 400 500	0 2 0
94	Field experiments with Calcium Cyanamide as a Nitrogenous manure for South Indian soils.	B. Viswanath and S. Kasinathan.	English	550	0 4 0
95	The work of the Live-stock section.	R. W. Littlewood.	Do.	1,000	0 6
96	Cultivation of grape vines.		Do.	900	0 2
	<i>Bulletin No. 75. Reprint.</i>				
...	A soil survey of the Kistna Delta.	W. H. Harrison and M. R. Ramaswami Sivan.	Do.	400	2 4 0

307. The Year Book of the Agricultural Department for 1927 was published during the year.

308. The work in connexion with the issue of a fourth and revised edition of Wood's Note Book of Agricultural Facts and Figures progressed well during the year under report and has since been issued.

309. The Villagers' Calendar for 1928-29 was published as usual in English and the Vernaculars. Eighty-seven thousand six hundred calendars were printed as shown below for sale and distribution :—

English	...	...	...	...	...	7,600
Tamil	...	...	...	...	...	32,700
Telugu	...	...	...	...	...	38,700
Malayalam	...	...	...	...	...	5,600
Kanarese	...	...	...	...	...	3,000

Total ... 87,600

310. The monthly Digest continues to be issued in English and the vernaculars Tamil, Telugu, and Malayalam and it is widely circulated, and appears to be appreciated.

311. The officers of the Department contributed the following papers to the Indian Science Congress at Madras in January 1929 :—

(1) Bionomics of *Tasar* Silk Worm in South India.

(2) Two new and remarkable Genera of *Thysanoptera* from South India.

(3) The Economic Status of Indian Thysanoptera

(4) New Species of *Senecio*.

(5) The Characters of the Cotton Boll in relation to its flowering period and position on the plant.

(6) A *Wilt* of *Zinnia* caused by *Sclerotium Rolfsii*.

(7) Relation between the position of the seed in a Lock and its weight in Cotton.

(8) The effect of time of planting on some Economic characters of the cotton plant.

(9) Life-history of *Lamprosema indicata*—A pyralid pest on Chrysanthemums.

(10) Studies on the Morphology and bionomics of *Empoasca devastans* Dis.

(11) The Mango *Hopper* Problem in South India.

(12) Excretion in *Melipona* (Hymenoptera) during Metamorphosis.

(13) Life history of *Ora picta*—Fam. Dascillidae.

(14) The Bio-Chemical Factors involved in the resistance of the Cotton Plant to the attack of Stem Weevil.

(15) Some Experiences of Rice-breeding work.

(16) Yield Factors in Cane Cultivation and their relation to Experimental Trials.

(17) The nature of action of Green Manure on Paddy soils.

(18) The effect of manuring on the quality of the crop.

(19) Earhead shapes and their inheritance in *Eleusine Coracana*, Gaertn.

(20) A Physico-Chemical study of the Tissue Fluids of *Phaseolus vulgaris* at various stages of growth.

(21) Recent Agricultural Development in Madras.

VIII.—ACCOUNTS.

312. The receipts and expenditure for the year and the corresponding figures for the previous year are as follows :—

	1927-28.	1928-29.
	RS.	RS.
Expenditure	17,67,231	18,35,083
Receipts	2,91,712	3,04,775
Net expenditure	14,75,519	15,30,308

313. The increase in expenditure in the current year as compared with the expenditure in the previous year is mainly due to—

(i) the addition of more staff for the millet and paddy breeding stations and for the entomological section ;

(ii) the purchase of motor exhibition vans and employment of additional agricultural demonstrators and demonstration maistries for the purpose of extending the propaganda work of the department.

314. The increase in receipts is due to—

(i) the sale of larger quantities of green manure seeds than in the previous year ;

(ii) the output of the produce of the new paddy breeding station at Pattambi and the Central Cattle Farm, Hosur.

IX.—STATISTICS.

315. *Annual season and crop report.*—The report for 1927-28 was issued on the 30th November 1928 and consisted of four pages of narrative and 15 pages of statement.

The normal figures of area were revised in the year on the basis of the latest three non-famine years.

316. *Forecasts.*—The areas estimated in the crop forecasts in 1927-28 differed from the actuals by about 0.5 per cent. for paddy, gingelly, and sugarcane, 1 per cent. for cotton, 2 per cent. for groundnut, and 5 per cent. for castor. The estimates were therefore reasonably correct.

317. The forecast returns received from *tahsildars* in Guntūr, Kurnool, Bellary and Anantapur were more satisfactory than in the previous year with reference to the areas under cotton pure and cotton mixed.

318. The practice of cabling forecast reports on cotton to the President of the International Institute of Agriculture, Rome, at his cost was continued in the year under review.

Intermediate monthly reports on forecast crops were issued as usual.

(a) *Weekly cotton mill and press returns.*

319. These returns continue to be published and distributed as before.

320. The publication of statistics of rail and river-borne trade which was discontinued for a time, was at the instance of the Government of India during the year renewed in the case of rail and river-borne raw cotton showing both exports from and imports into each trade block and the origin and destination of the exports as well as the imports by trade blocks from October. These statistics will be very useful as a check on the estimates of production of cotton in the Presidency published in the forecast and season and crop reports.

321. *Cotton markets.*—Effect was not given to the proposal to open a cotton market at Tiruppur owing to the opposition of the vested interests. The necessity for the cotton markets at Tiruppur and other important centres was pressed on the Provincial Cotton Committee, especially, by the special officers' report on the investigation into the finance and marketing of cultivators' cotton in the Northern and Western area. Government were therefore addressed on the necessity for the passing of an enabling Act on the lines of the Bombay Cotton Markets Act to establish markets for the sale of special crops like cotton and to regulate their working, so as to ensure the protection of the interests of the grower and consumer, the licensing of *dalalidars* and weighmen, the standardization of deductions, and the test and verification of weights. The question is now pending with Government.

(b) *The Provincial Cotton Committee.*

322. The members of the Provincial Cotton Committee retired by efflux of time and their places were filled up during the year.

kuravai will proceed to fourth year trials, and first and second year trials will be made of several other strains. Manurial and cultural experiments will be continued.

331. At Maruteru progress will be made with trials of a number of promising strains and the problem of overcoming the water shortage in April by evolving shorter duration paddies will be studied. Green manuring problems will also be investigated.

332. At Pattambi strip trials will be made with 163 strains of first crop varieties, 88 dry land strains and 250 second crop strains and nutritional work will be done.

333. *Cotton*.—This work will follow the following lines, genetics, the examination of a cross between cambodia 440 and *Ishan*; isolation of pure strain of *herbaceum* and cambodia cottons; manurial experiments with irrigated cotton and an investigation of the movement of nitrogen in the soil; cultivation experiments to determine the effect of early sowing and the water requirements of the crop.

334. At Kovilpatti the purity of *karunganni* strains will be tested, fresh selections made for high yield, the causes which tend to depress the seed and lint weight will be investigated, and trials with pulses will be made with the object of discovering one that will fit the local rotation.

335. *Millets*.—A study will be made of the mode of inheritance of characters of *cholam*, *ragi*, and *tenai*; single plant selections will be made with the object of raising the yield of *periamanjai cholam* for the Coimbatore area, *tella jonna* for Bellary area and of *pacha jonna* for the Nandyal area.

336. *Botany*.—The study of the weeds of cultivation will be continued, the survey of fodder grasses will be continued, and a botanical survey will be made of Ganjam, Cuddapah, Rāmnād and Coimbatore districts.

337. *Mycology*.—Special attention will continue to be devoted to problems in connexion with *piricularia* of paddy, *mosaic* of sugarcane, diseases of betelvine, *rhizoctonia* of groundnut, cotton wilt, coconut leaf rot, and mildew of chillies.

338. *Entomology*.—Special attention will be devoted to problems in connexion with paddy stem-borer, control of coconut caterpillar, hairy caterpillar campaign, *spodoptera* campaign, and work on mango *hoppers*, fruit flies and moths, *pollu* disease, grass hopper pests. An attempt will be made to control the *Icerya* scale by means of its imported predators.

339. *Chemistry*.—The following problems will receive special attention, the base exchange relations of different soils with reference to their manuring; the control and utilization of soil moisture under dry farming conditions; the effect of manures on the quality of the crop; the fermentation of green manure; the utilization of organic nitrogen by paddy; the fermentation of waste organic materials into manure.

340. *Bacteriology*.—The investigations into the bacteriological utilization of Trichy phosphates, and the seasonal variation in the bacterial content of milk will be continued.

341. *Animal nutrition*.—The following problems will be studied, the digestibility of common fodders and concentrated foods by animals at rest; the effect of supplementing a ration with bonemeal on the growth and health of calves.

342. *Livestock*.—The breeding policy at present in force will be pursued and cross breeding work will be continued. As many bulls will be distributed for stud purposes as possible. Attention will be concentrated on breeding to certain districts, viz., Coimbatore for Kangayams, Guntūr for Ongoles, and the West Coast, Malabar and South Kanara for Scindhies.

343. *District work*.—This will be developed along the usual lines and special attention will be devoted to seed multiplication.

344. Special lines of work which will receive attention in the various circles are indicated below :—

I. Improved cultural methods of growing sugarcane, the use of nursery cane, and the reduction of water rate will be specially demonstrated and taught.

II. Special attention will be paid to cultural improvement of the turmeric crop, the amelioration of

the attack of *thrips* on chillies, the introduction of J. 247 cane and of better strains of paddy.

III. Cotton seed multiplication ; improvement of paddy cultivation in Cuddapah and Anantapur districts ; improvement of sugarcane cultivation in Hospet taluk.

IV. An attempt will be made to start a small station in Chittoor district to discover a short duration variety of cane ; fodder crops will be introduced and seed farms enlarged and developed.

V. Special attention will be devoted to seed farms and seed supply ; more attention will be devoted to dry crops, and new sub-circles will be opened.

VI. The main lines of work will be cotton improvement, improvement of sugarcane cultivation and *jaggery* making and the introduction of fodder crops. The new agricultural middle school at Usilampatti will be developed.

VII. Special attention will be paid to the making of composts and silage. An attempt will be made to meet the growing demand for coconut seedlings and pepper cuttings by establishing nurseries.

VIII. Introduction of H.M. *gunlaka* as a ground-nut harvester ; introduction of line sowing in dry taluks ; preparation of composts ; organization of more cotton seed societies and the introduction of the joint sale of cotton and distribution of seed by private agencies.

345. *Nilgiris*.—An attempt will be made to demonstrate and introduce improved methods of growing potatoes, fruit and vegetables among the Badagas and Todas.

346. *Agricultural education*.—The Degree Course will be continued at the Agricultural College, Coimbatore, 46 new students being admitted. Teaching will be intensified and special lectures will be delivered. Agricultural Middle Schools will be opened at Usilampatti and Kalahasti.

347. *General*.—Centralization of clerks will be carried out at the Agricultural College, the research officers will be relieved of administration duties as far

as possible and a headquarter Deputy Director of Agriculture will take special charge of propaganda and demonstration work in accordance with the new reorganization scheme. Three motor exhibition van units will be at work on propaganda.

I have the honour to be,

Sir,

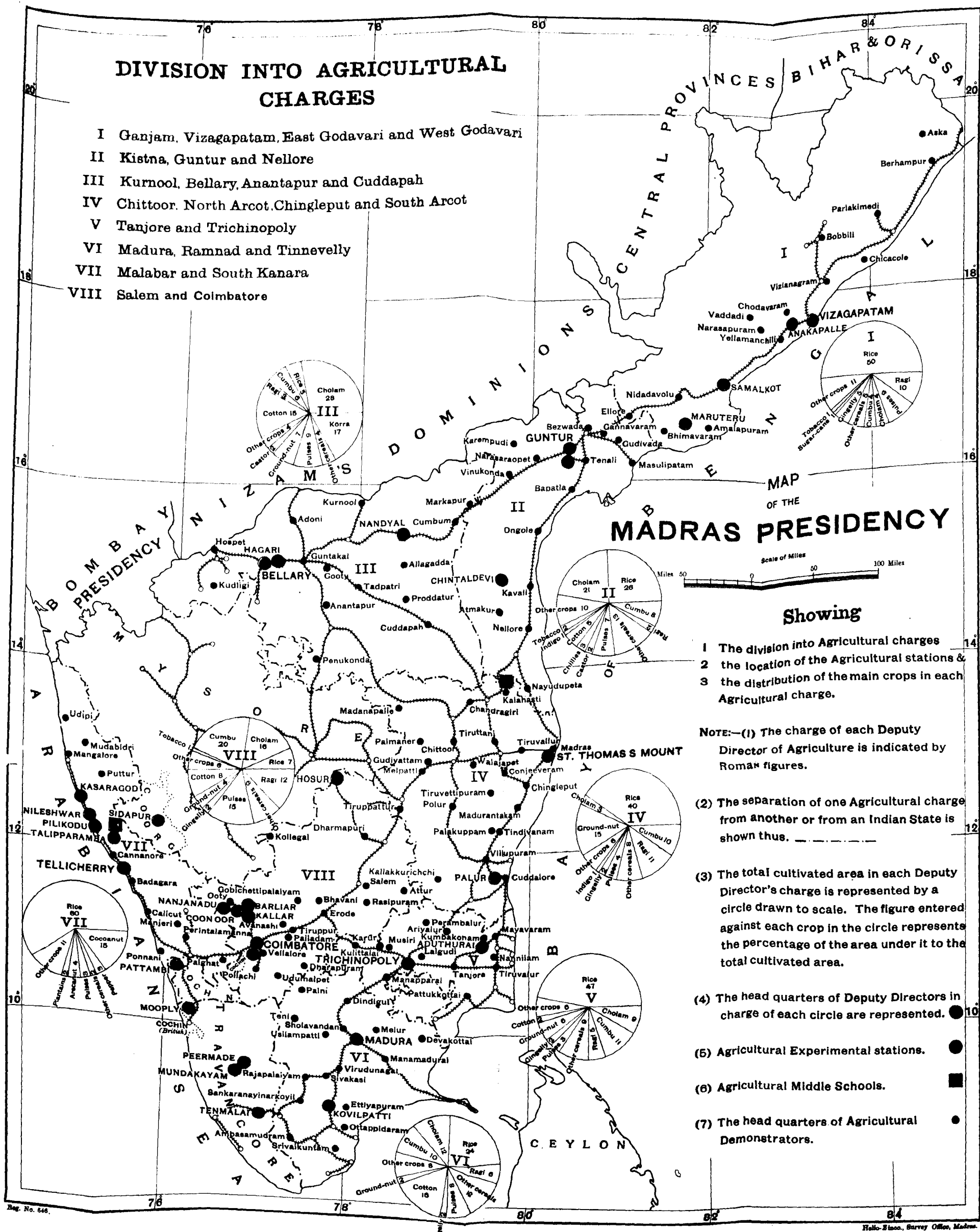
Your most obedient servant,

RUDOLPH D. ANSTEAD,

Director of Agriculture.

DIVISION INTO AGRICULTURAL CHARGES

- I Ganjam, Vizagapatam, East Godavari and West Godavari
- II Kistna, Guntur and Nellore
- III Kurnool, Bellary, Anantapur and Cuddapah
- IV Chittoor, North Arcot, Chingleput and South Arcot
- V Tanjore and Trichinopoly
- VI Madura, Ramnad and Tinnevely
- VII Malabar and South Kanara
- VIII Salem and Coimbatore



MAP OF THE MADRAS PRESIDENCY

Showing

- 1 The division into Agricultural charges
- 2 the location of the Agricultural stations & the distribution of the main crops in each Agricultural charge.

NOTE:—(1) The charge of each Deputy Director of Agriculture is indicated by Roman figures.

- (2) The separation of one Agricultural charge from another or from an Indian State is shown thus. — — — — —

- (3) The total cultivated area in each Deputy Director's charge is represented by a circle drawn to scale. The figure entered against each crop in the circle represents the percentage of the area under it to the total cultivated area.

- (4) The head quarters of Deputy Directors in charge of each circle are represented. ●

- (5) Agricultural Experimental stations. ●

- (6) Agricultural Middle Schools. ■

- (7) The head quarters of Agricultural Demonstrators. ●

Government of Madras.

DEVELOPMENT DEPARTMENT

G.O. No. 2034, dated 19th November 1929.

Agriculture—Administration Report—1928-29—Recorded with remarks.

READ—the following paper :—

Letter from R. D. ANSTEAD, Esq., M.A., C.I.E., Director of Agriculture, Madras, to the Secretary to Government, Development Department, dated Madras, the 15th August 1929, R.O.C. No. D. 68-Pdl.

Order—No. 2034, Development, dated 19th November 1929.

Recorded.

2. The Government have read with interest the account of the various activities of the Agricultural department presented by Mr. Anstead in the annual administration report for 1928-29. The event of importance in the year under review is the publication of the report of the Royal Commission on Agriculture. The Government have proceeded to take action on these recommendations by the appointment of an Agricultural Advisory Committee to examine how far effect can be given with advantage in this Presidency to the recommendations of the Royal Commission and also by sanctioning the comprehensive scheme of reorganization of the department submitted by Mr. Anstead to enable it to expand on a systematic

plan of progressive development. The Government have generally accepted the reorganization scheme in principle and have sanctioned an expenditure of Rs. 72,400 during 1929-30 for making a very substantial beginning and it is hoped that this would strengthen the resources of the department in tackling the important problems of research and propaganda.

3. As usual the demand for collegiate education continued to be on the increase though this cannot be said of middle school education. The middle school at Taliparamba alone functioned during the year under review and the Government hope that the other schools referred to in the last year's review, will be opened and commence work soon.

Economic research to improve the quality and outturn of paddy continued on the same lines as in previous years at the four paddy breeding stations and the possibilities of hybridization and selection were further examined. The Government are glad to note that the study of sowing at different seasons has been completed and that good progress has been made with the investigations of the possibility of obtaining the maximum food value in respect of the new selections.

Work on sugarcane, cotton and other dry crops continued on the normal lines and steady progress is recorded in the increasing area under the improved strains evolved by the department. There is an ever-increasing demand from the ryots for seeds evolved by the department and this is a good indication of the fact that the ryot is appreciating the usefulness of the department. The creation of the post of "Oil-seed Specialist" will permit of due attention being given by the department to this important industrial crop. The new millet station which is proposed to be opened next year at Adoni is expected to give an impetus to work on dry crops.

The Mycological and Entomological sections continued investigation of the fungoid and parasitic causes of plant-diseases. It is satisfactory to note that three disease-resistant varieties of paddy have been found and that the fungus responsible for the bud rot and seedling blight of cotton has been located to be in

the seed coat. The most important feature of entomological work during the year was, however, the discovery of the notorious fluted scale "*Icerya Purchasi*" on the Nilgiris and in order to successfully combat it, its natural parasite, the *Vedalia* beetle, was imported and released.

Steady progress is recorded at the four cattle stations. The number of Government bulls placed at stud outside Madras has risen appreciably and premia are being given for the maintenance of 36 stud bulls by the ryots.

The department took advantage of the various fairs and exhibitions held during the year for purposes of demonstration. The propaganda work of the department received facilities during the year with the advent of the motor exhibition units which are able to reach the ryots of out-of-the-way villages. The Government wish to stress the importance of this branch of activity of the department inasmuch as the results achieved by the other branches can be passed on to the ryots only through propaganda and demonstration.

The Agricultural and Co-operative departments worked in harmony and the loan and sale societies worked successfully in the matter of supplying pure seeds of improved strains produced under departmental supervision.

Special attention has been paid to the green manure problem and synthetic farmyard manure, and the recent sanction of the "subsidized manurial scheme," it is hoped, will place the department in a position to give definite advice in regard to the economic use of fertilizers.

The Research Engineer has designed a drill which is likely to become a standard implement.

The programme of work drawn up for 1929-30, which is largely a continuation of work already commenced, is approved.

The aim of research stations being mainly the evolution of disease-resistant strains, progress is necessarily slow and great deal has yet to be done in the effective tackling of the blast disease of paddy, mosaic disease of sugarcane, boll rot and seedling blight of cotton and the wilt disease of betel vine and

4 No. 2034, DEVELOPMENT, 19TH NOVEMBER 1929

groundnut. Government hope that the introduction of the present comprehensive scheme of reorganization and development of the department will greatly help it in its endeavour to be useful to the ryots and the agricultural interests in this Presidency.

(By order of the Government, Ministry of
Development)

S. V. RAMAMURTI,
Secretary to Government.

To the Director of Agriculture.

" Director of Veterinary Services.
" Registrar of Co-operative Societies.
" Law (Education) Department.
" Public Works and Labour Department.
" Public Department.
" Accountant General.
" Director of the Research Institute, Pusa.
" Government of India, Department of Education, Health and Lands
" (with C.L.).
" Secretary, Imperial Council of Agricultural Research.
Press.



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தமிழ்நாடு ஆவணக்காப்பக நூலகம்,
எழும்புடி, சென்னை-600 008.

தவணைத்தொள்.

சே. எண் :

ப. எண் :

வழங்கிய தொள். (1)	திரும்பிய தொள். (2)	வழங்கிய தொள். (1)	திரும்பிய தொள். (2)
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