



**Government of Madras**

DEVELOPMENT DEPARTMENT

**G.O. No. 1349, 15th October 1932**

Agriculture—Administration Report, 1931-32—Recorded with remarks.

READ—the following paper :—

From the Director of Agriculture, dated 10th August 1932,  
 R.O.C. No. D-68-Pdl./32.

**Order—No. 1349, Development, dated 15th October 1932.**

Recorded.

2. *Administration.*—The direction underwent some changes during the year. Mr. Hilson acted as Director until the middle of May when he went on leave and Rao Bahadur Ananda Rao was put in charge while continuing to do the duties of Headquarters Deputy Director. This arrangement lasted for eight months and the present Director was in office for only two months in the year.

3. *Education.*—The Agricultural College continued to attract a large number of candidates for admission though the number fell to 321 (against 48 vacancies) from 365 in 1930-31—partly perhaps on account of the unfavourable prospects of agriculture during a time of falling prices. Circumstances have made it necessary to introduce tuition and lodging fees (amounting together to Rs. 120 a year) during the current year, but it is not anticipated that this will discourage applicants of the right type. School education in agriculture has not proved successful and the school at Taliparamba has now been ordered to be closed.

4. *Research.*—Research followed the usual lines in the subjects of botany, chemistry, crops, entomology, mycology, horticulture, livestock and engineering implements. The supreme importance of organic manure, both for animal nutrition and for crop yield was emphasized in the course of chemical research. Millet research was carried a stage further, nearly a thousand units of sorghum being dealt with at Coimbatore, of which two, A.S. 809 (yellow) and A.S. 1575, have been handed over for trial on ryots' lands. Some part of the

research in millets has been transferred to the stations at Nandyal and Hagari to ensure a more natural environment for certain strains. It is hoped that experiments in this most important group, whose practical application has been retarded by the season vicissitudes to which this crop is especially liable and by its exposure to natural pollination, will soon bear ample fruit.

As regards paddy, while varietal and cultural experiments continued, the most interesting points perhaps are (a) the expansion of improved seed distribution and (b) the test of crops for cultivation in rotation with and in substitution of paddy, e.g., sugarcane, plantain, ragi, gingelly, fodder sorghum, groundnut, and Cambodia cotton. The experiment of growing the last-named with canal water in delta areas when the water is insufficient for a paddy crop is reported to be full of promise. The importance of this to the ryots of the Godavari and Kistna deltas can hardly be over-estimated.

The question of seed distribution, though one rather of propaganda and demonstration than of research, is of immense importance in regard both to paddy and to cotton. It appears from the Report that over 2,000,000 lb. of selected paddy seed (by direct agency and through co-operative societies and other private means), and over 900,000 lb. of cotton were distributed during the year. These represent seed for cultivation of 100,000 acres of paddy and about 90,000 acres of cotton (about 1 per cent and 5 per cent respectively of the area under each crop). It would be of interest to know the total area *constantly* cultivated with improved strains of these crops so as to gauge progress. The Director will be asked to consider the compilation of such figures in future Reports. The statements of areas covered by seed distribution might also with advantage be more methodically arranged.

The development of the study of fodder grasses, both in the Botany and in the crop sections, is of importance to work on livestock. Oil-seeds and fruits are comparatively new studies of research in the Presidency the importance of which is evident; and in the former line the Oil-seeds Specialist has now been working for a little over a year—a period far too short to permit of definite results.

The study of sugarcane has been actively revived, both on its own merits as a crop for which the Presidency is peculiarly suited, and as a substitute for paddy. By far the most interesting discovery recorded is that achieved by the Imperial Sugarcane Expert, who has produced a cross between sugarcane and sorghum requiring only six months for cultivation instead of ten months—a most valuable achievement.

5. *Demonstration.*—The chapter on demonstration shows the gradual development of the scheme of re-organization sanctioned in 1929 with the Deputy Directors serving as the personal link between research and demonstration and the demonstrators concentrating their attention on a single village or group of villages at a time. With this chapter should be read the list of publications by which the Department endeavours to diffuse agricultural knowledge and the simpler scientific studies among the literate agricultural population. More precise evidence of the extent to which scientific discoveries are being put to practical use by the ryots would be welcome; especially in regard to livestock and engineering research which appear at present to be somewhat too centralized and divorced from the local everyday life of the agricultural population. Reference is made in the Report (paragraph 41) to the help of co-operative societies in spreading agricultural improvements. The Government regard close co-ordination between the Agricultural and the Co-operative departments as of vital importance, and the next Report should state as fully as possible what is being done in this direction.

6. *Retrenchment.*—The Department, like all others, suffered somewhat severe retrenchment during the year, but its organism remains unimpaired and expansion, when opportunity arises, can be made without difficulty. Meanwhile it has received valuable help from the Imperial Council of Agricultural Research which has agreed to finance a rice research station in Ganjam, and from the Indian Central Cotton Committee which has financed certain entomological experiments in connexion with cotton. There can be little doubt that agricultural research in Madras as elsewhere is destined to receive a great stimulus from the activities of the Imperial Council established by the Government of India in 1929.

(By order of the Government, Ministry of Public Works)

S. H. SLATER,  
*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.  
 „ Finance Department.  
 „ Accountant-General.  
 „ Government of India (Education, Health and Lands) (with C.L.).  
 „ Secretary, Imperial Council of Agricultural Research (with C.L.)

Press.

CONTENTS

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	PAGE
I. Administration .. .. .	1
II. Agricultural Education .. .. .	2
III. Season .. .. .	5
IV. Research .. .. .	6
V. Demonstration .. .. .	23
VI. Legislation .. .. .	33
VII. Publications .. .. .	35
VIII. Statistics .. .. .	37
IX. Expenditure .. .. .	39
X. Programme of Work for 1932-33 .. .. .	40
Glossary .. .. .	45

R.O.C. No. D. 68-Pdl./32.

OFFICE OF THE DIRECTOR OF AGRICULTURE,

*Madras, dated the 10th August 1932.*

From

S. V. RAMAMURTY, Esq., I.C.S.,

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 1931-32.

I.—ADMINISTRATION.

2. Mr. G. R. Hilson acted as Director of Agriculture till 13th May 1931 when he went on leave preparatory to retirement on proportionate pension. From that date M.R.Ry. Rao Bahadur D. Ananda Rao Garu, Headquarters Deputy Director of Agriculture, held charge of the post in addition to his own duties till 1st February 1932. I took charge of the Directorship on 2nd February 1932.

*Indian Agricultural Service.*

3. M.R.Ry. Rao Bahadur D. Balakrishnamurti Garu, Deputy Director of Agriculture, retired during the year.

*Madras Agricultural Service.*

4. Messrs. M. Govinda Kidavu, Deputy Director of Agriculture, and H. E. R. Dunhill, Assistant Agricultural Engineer, retired from service during the year. In place of the latter, M.R.Ry. B. M. Lakshmipathi Mudaliyar has since been recruited. Messrs. M. U. Vellodi, G. Jogiraju, R. Swami Rao and M. Viraraghava Rao were confirmed in the Madras Agricultural Service. Towards the end of the year, Mr. P. Subrahmanyam was selected for admission to the service as a District Agricultural Officer.

*Madras Agricultural Subordinate Service.*

5. Fifteen posts of lower subordinates which were vacant were surrendered at the beginning of the year, as recruitment to this class of service has ceased. Seven additional posts of agricultural demonstrators were sanctioned during the year as Part II scheme. This sanction, however, was subsequently cancelled as a measure of retrenchment. The sanctioned staff, therefore, continued to be the same as at the end of the previous year.

*Retrenchment.*

6. The matter that exercised the minds of the members of the department most during the year was the consideration of the proposals for retrenchment. The axe was laid heavy even on a nation-building department such as this and no less than 15 officers of whom 3 were from the gazetted service were retrenched before the official year closed. The details of the posts abolished are as below :—

## Madras Agricultural Service.

- (i) Systematic Botanist.
- (ii) Superintendent, Cotton Breeding Station.
- (iii) Assistant Entomologist.

## Madras Agricultural Subordinate Service.

- (i) One post of upper subordinate, IV grade, Assistant Curator.
- (ii) Six posts of upper subordinates in V grade (including one temporary) viz.—
  - (1) Assistant Lecturer in Dairying.
  - (2) Assistant Lecturer in Agriculture (temporary).
  - (3) Assistant in Systematic Botany.
  - (4) & (5) Two teachers for Agricultural Middle School, Taliparamba.
  - (6) One teacher for Borstal Institute, Tanjore.
- (iii) Two posts of lower subordinates in V grade—Systematic Botany section.
- (iv) One Assistant Lecturer in Engineering.
- (v) One artist } Systematic Botany.
- (vi) One clerk }
- (vii) Three peons—Two for Systematic Botany and one for Entomology.

## II.—AGRICULTURAL EDUCATION.

7. There was no change in the activities of the Department in regard to agricultural education, the college and schools to which reference was made in last year's report being continued.

8. *Agricultural College, Coimbatore.*—The number of applicants to the college dropped to 321 from 365 the previous year. Of this number, only 234 presented themselves before the Selection Committee, of whom 45 were finally selected leaving three seats

for the three failed students of the previous year. The personnel of the Selection Committee consisted of the Headquarters Deputy Director of Agriculture in charge, the Principal, M.R.Ry. Diwan Bahadur M. Ramachandra Rao Pantulu Garu, M.R.Ry. Diwan Bahadur C. S. Ratnasabhpati Mudaliyar Avargal and Khan Bahadur P. Kalif-ul-lah Sahib Bahadur. The Committee decided not to reserve two seats for the Agency as two of the six selected last year failed and were readmitted. The Committee made definite recommendations to Government that the number of students to be admitted to the college should be increased and that short courses be instituted. After careful consideration, the Government thought it unnecessary to increase the number just at this juncture as owing to retrenchment, passed graduates could not all find employment in Government service but stated that the proposal would be considered when financial conditions improved. Similarly the detailed report regarding short courses referred to by Government in their remarks on the administration report of last year which was called for from the Director was scrutinized by them but it also had to be postponed in view of the additional expenditure involved thereby.

The University approved the revised regulations and syllabus of the B.Sc., Ag., course to come into force from the academic year 1932-33. Apart from minor changes in the syllabus, the regulations aim at students sitting for the University examination at the end of the first year itself instead of appearing at the end of the second. As an outcome of retrenchment, the tuition and lodging, hitherto free, will in future be charged for, the fee for the former being Rs. 120 per annum and the latter Rs. 2 per mensem. Special lectures were delivered to students as heretofore not only by several heads of sections, but also by the second Sugarcane Breeder and Sericultural Expert in their special branches.

*Examinations.*—Forty-eight appeared for B.Sc. Part I, in March-April 1931 and 31 completed it. In the same year, of the 56 that appeared for the B.Sc. Part II, 31 qualified themselves for the degree.

*Scholarships and Prizes.*—Four scholarships—one for merit, one to a Muhammadan and two to poor and deserving students, were awarded this year. The remaining two intended for the depressed classes were suspended as there were no students from that community this year. Two prizes, in addition to the ones already in existence, were introduced during the year, namely, the old Cuddapah District Agricultural Association Prize to students coming from the Ceded districts, and the taluks of Vayalpad and Madanapalli of the Chittoor district under certain conditions, and the Sampson Memorial Prize, to the student who obtains the highest number of marks in Botany in Part II of the examination for B.Sc. degree.

*Tours.*—Apart from the reasons given in last year's report, financial stress necessitated the curtailing of the tours to three

short ones. Classes II and III were taken on tours to the West Coast and Tamil districts.

*Library.*—In order to give students special facilities for making use of the library, and also to relieve congestion at the main buildings, text-books and such others as were required by students were transferred to the Freeman Building, necessary provision being made for lighting to enable students to study at nights.

*Dairy.*—The Dairy is maintained mainly for giving practical training to the students in regard to milk and milk products. The surplus milk from this Dairy after meeting the requirements of teaching, is supplied to the Students' Hostel and to residential officers on the Estate.

During the year 1931-32 the Dairy was worked at a loss of Rs. 8,319 as against Rs. 9,014 in the previous year as audited by the Accountant-General. This loss is partly due to the high price of milk and its products which could not therefore be all sold. Steps have been taken to reduce the expenditure by cutting down the staff and by reduction of other overhead expenditure. The prices of milk and butter have also been reduced in order to obtain better sales of the products available.

9. *Conference.*—The College Day and Conference were held this year in December instead of in July as was the custom, with a view to hold the conference of gazetted officers also at the same time, but unfortunately for financial reasons, Government were unable to sanction the holding of the latter conference. The Hon'ble Mr. P. T. Rajan, Minister for Public Works, presided over the Conference when papers on "Cholam" dealing from the different view-points of the agriculturist, the breeder, the chemist, and the pathologist were read and discussed.

10. *Agricultural Middle Schools.*—The only Agricultural Middle School at Taliparamba continued to function during the year. There were only three admissions to the first-year class, while the second-year class had only 5 pupils. The total strength of the school was, therefore, only 8 as against 16 in the previous year. On the recommendation of the Retrenchment Committee, the school was closed from 1st April 1932. The school at Usilampatti continued to be maintained by the Madura District Board. It is encouraging to learn that at the end of the year, there were 23 pupils in the school as against 15 in the previous year. The Agricultural School at Kalahasti could not be opened even this year.

11. *Farm Labourers' Schools.*—The three schools at Anakapalle, Palur and Coimbatore continued to work satisfactorily. At Anakapalle there were 40 boys as against 33 in the previous year in the day school and 21 adults in the night school as in the previous year. At Palur, the number of boys in the day school increased from 14 to 18, while as in the last year, there were 17 adults in the



night school. At Coimbatore, however, there were only 8 boys in the day school and 10 adults in the night classes as against 14 and 11 respectively last year.

12. *Practical Training in Agriculture.*—Although all the agricultural stations are available for teaching men desirous of taking a course in practical farming, very few have so far taken advantage of such facilities. However, 8 men at Anakapalle and 2 at Samalkota were under training during the year. Most of these came with the definite object of being employed as maistris and not to return to their lands.

### III.—SEASON.

13. The south-west monsoon became active on the West Coast only from about the middle of June. Rainfall was moderate and piecemeal till September except on the West Coast which received excessive rains in August. A depression formed in the Bay of Bengal off the Circars' Coast during the third week in September and uniformly good rains were received. A further depression in the Bay of Bengal off the Circars' Coast developed into a storm on the 11th October which moved westwards and crossed the coast near Calingapatam on the 13th causing fairly widespread rain in Ganjam and Vizagapatam. There was also considerable damage to crops, property and railway line in the Vizagapatam district. After the 17th, the south-west monsoon abated and a transition to the north-east monsoon type of weather set in. On the whole, the south-west monsoon was below the average except in East Godavari, West Godavari, Kistna, Guntur, Nellore, Chingleput, Chittoor, North Arcot and the West Coast. The average was exceeded by 32 per cent in Malabar and 40 per cent in South Kanara. There were freshes in the main rivers and channels and tanks connected with them received adequate supplies.

A depression on the 24th October formed in the Bay of Bengal and, moving in a north-easterly direction, caused fairly widespread rain in the north Madras coast till the 27th. A depression again formed in the south-west of the Bay of Bengal on the 29th, intensified into a storm in the course of the 30th, and moving north-westwards, crossed the coast between Masulipatam and Nellore on the 31st morning. Fairly widespread and locally heavy rain fell in the Presidency on the last four days of the month. The rainfall in the month was below the average except in the Circars, Cuddapah, Nellore, Chingleput and Chittoor. In November, the monsoon was active in south-west Madras where scattered falls of rain occurred on most of the days during the month. Rainfall extended occasionally in Malabar, the Deccan and the north Madras coast. In December, a depression formed to the south-east of Ceylon on the morning of the 9th and moved north-westwards to the south-east Arabian Sea. The result was very heavy rain in south-east Madras on the 9th, 10th and 11th, causing floods in the rivers and damage to crops in the Tinnevely district. Conditions were again unsettled to the south-east of Ceylon on the

21st morning. A storm formed on the 22nd, moved north-westwards, and crossed the coast about 20 miles south of Negapatam on the 24th evening. It was responsible for fairly widespread rain with locally heavy falls in south-east Madras and for breaches in the railway and telegraph lines. Scattered falls also occurred in south Madras intermittently except in the second week, and in the Deccan and the north Madras coast between the 15th and 25th. The rainfall was generally above the average in the months of November and December. On the whole, the north-east monsoon was above the average except in the Deccan and Malabar.

The effect of the season on the crops at the various agricultural stations is described below :—

At Anakapalle, paddy, sugarcane, ragi, groundnut and horsegram were affected by floods during the north-east monsoon period. At Samalkota and Maruteru, the yield of paddy was reduced by rains, particularly at harvest. At Guntur, cumbu and korra were affected by the rains received at the time of harvest in the second fortnight of September. At Chintaladevi, late sowings and concentrated excessive rains reduced the yields of crops generally. The season was unfavourable for cholam at Nandyal and Hagari and for groundnut at Nandyal. Cholam at Hagari suffered from the attack of the shoot bug (*Pandaluoya simplicia*). At Palur, strong winds accompanied by rains in December lodged the tall grown sugarcanes to some extent. At Palakuppam, the season was not favourable for groundnut. At Kovilpatti, the season was good for cumbu, fodder cholam, and cotton and bad for pulses. At Taliparamba and Pattambi, crops suffered from heavy rains in August and drought during the north-east monsoon period. At the Cotton Breeding Station, Coimbatore, the season was favourable only for pulses and late-sown cotton.

#### IV.—RESEARCH.

14. The part that research plays in the activities of the department in the advancement of improved agriculture and the role of the specialist at the college and of the Deputy Director at the agricultural station, who works in collaboration with the same end in view were discussed in detail in last year's report and need no reiteration here. Suffice it to say that as will be explained in the following paragraphs, research progressed on the same lines but in various directions.

##### A.—Botany.

15. The section of Systematic Botany besides being engaged in systematic work diverted a large part of its time to problems of economic nature, as one would expect the latter to take an increasingly important part as time goes on.

Six thousand four hundred and sixty-five specimens were identified as against 4,556 in the previous year, the number of specimens received for identification being largely from officers outside the department and from the public which goes to prove

not only the popularity but the importance of the section. One thousand two hundred and thirty-six sheets were stamped, numbered, labelled and incorporated. A beginning was made with the revision of the nomenclature of the herbarium sheets. Botanical survey was continued in the districts of Ganjam, Coimbatore, Malabar and South Kanara, and nearly 3,000 specimens of flowering plants were collected.

Another function that this section performs is concerned with the loan, exchange and distribution of botanical specimens with a view to widen the usefulness of the herbarium. Botanists and others interested in the herbarium presented it with rare or new species which enhanced the value of the herbarium. If one were to evaluate in hard cash the collections of a herbarium of this nature it is bound to be to the tune of several lakhs of rupees.

Under economic work may be mentioned the incorporation of nearly 2,000 sheets of cultivated plants, the addition to the collections of fresh drugs and poisonous plants, the continuation of the survey and study of fodder grasses in the Kangayam and Gopichettipalaiyam taluks of Coimbatore district and the West Coast and the study of one of the most pernicious weeds—*Alternanthera echinata* (khaki weed), originally a native of South America, but inadvertently introduced into South India not long ago and which is making steady inroads into several districts of the Presidency, Coimbatore and Salem being at present the chief sufferers. Experiments with a view to discover ways and means to eradicate it are in progress.

The outstanding work of this section this year was the study and survey of the plantains of the Presidency, reference to which will be made under its more appropriate section, on fruit.

#### B.—Chemistry.

16. This section dealing, as it does, with comprehensive and important subjects such as analytical and advisory work, animal nutrition, plant nutrition, and soil science, is equipped with the necessary staff and laboratories.

(1) *Analysis*.—Several departments of Government and the public utilize the services of the Analytical section as usual in having samples of soils, manures, feeding stuffs, fodders, etc., analysed, and in obtaining advice on matters dealing with such kindred subjects.

(2) *Animal Nutrition*.—Reference was made last year to the investigation of the influence of the manuring on the quality of seed and on the nutritive value of the crop. Further researches confirmed the opinion that organic manures like cattle-manure and oil-cakes have a more potent influence on the nutritive value of a crop than other manures like mineral fertilizers; this information is of the utmost practical importance to us as a large body of our ryots depends mainly for their manure supply on cattle-manure alone which is so essential to the food-crops on which our millions

depend. It was reported last year that in dealing with the feeding of animals the Ongole work animal is more economical than the American animal. Similar work done with the Kangayam, another important breed of South India, revealed that taking animals of equal weight and put on similar kinds of work, the Kangayam is a more economic feeder than the Ongole, a fact in conformity with everyday experience, placed as they are in much more uncongenial conditions of soil and pasturage than those in Ongole. Other facts brought out by researches in this section are that work does not increase the digestion coefficient although it increases the quantity digested, that animals fed on bonemeal and lime supplement in addition to their normal rations thrive better than those which did not receive the minerals. This latter point, therefore, emphasizes the utmost importance of feeding livestock with concentrates, a practice which in the country, is rather an exception than the rule. The causes for the high nutritive value of sorghum, the effect of sulphur on the quality and composition of wool and the comparative feeding trials of sorghum malt and Horlicks malted milk were other problems under investigation. In the case of the last, a feeding test on albino rats indicated the superiority of malt prepared from sorghum.

(3) *Plant Nutrition*.—At the instance of the Imperial Council of Agricultural Research the results of manurial experiments that have been in progress during the last quarter of a century were collated, the Council bearing the cost of the special staff employed for the purpose. The enquiry showed that the most useful manures for paddy are green manures in combination with or without phosphate, oil-cakes for sugarcane and for all dry and garden land crops, farmyard manure and that artificial manures are not indispensable, and that they serve best only in combination with organic manures. While among phosphatic manures, bonemeal and superphosphate proved profitable, crops showed little response to potassic manures.

Experiments were laid down with a view to render bones brittle and easy to crush by methods within the means of ryots and without employing machinery. Experiments have also been made to convert the finely ground Trichinopoly rock phosphate by bacteriological methods into manure approximating superphosphate in its effects on crops. The important role that bulky organic manure plays in crop production and nutrition has been stated above. It goes without saying that efforts should be made to augment its supply by all possible ways. Composts made of various waste materials showed that they are as good as farmyard manure in all respects. The use of night-soil for manurial purposes was under investigation during the year.

(4) *Soil Science*.—The study of the conservation and movement of moisture was continued at the Hagari Agricultural Station, while a similar but modified scheme was started at Coimbatore preliminary to the extension of the work at the former station. Results of research so far made seem to indicate that (1) moisture varies directly with the amount of rainfall received, but inversely

with the evaporation of soil surface, (2) the upward movement of water is limited to within 2 feet below the surface which is not therefore useful to the crop, (3) soil mulch does not protect the soil from evaporation, although it helps in increasing crop production, (4) while deep ploughing helps in the retention of moisture and exercises economy in its use, too frequent deep ploughing is harmful, probably due to too rapid an oxidation of organic matter, and (5) banded plots give the most satisfactory results.

Of all the manures, nitrogen, the most expensive, is apt to be lost into the air; the loss appears to vary with the quantitative relationship between the amount of organic matter and nitrogen. The investigations made this year show that when organic matter is added to the soil, the gain of nitrogen was appreciable due to the fixation of atmospheric nitrogen. But when an artificial manure like sodium nitrate was added to the soil, there was a loss of nitrogen which varied with the amount of organic matter present. This at once emphasizes the importance of equipping our soils with adequate supplies of organic matter before artificials are applied to any extent.

*Miscellaneous.*—The activated sludge plant intended for the treatment and utilization of the estate sewage was under the scientific control of the Agricultural Chemist. Preliminary investigations were made on the possibility of combining the keeping quality and attractive colour of jaggery, both of which do not generally go together. Other investigations included the study of the chemistry of mosaic disease on sugarcane and the analysis and examination of a large number of insecticides and fungicides.

#### C.—(1) *Crops.*

17. (a) *Millets.*—A departure was made this year by transferring two trained assistants in Millets for work on these crops at Hagari and Nandyal, and placing under the control of the Deputy Director of Agriculture, III Circle. These were concerned chiefly with work on sorghum—the most important cereal grain of the Ceded districts. One hundred and fifty-four and 80 sorghum single-plant selections in various stages of trial were transferred respectively to Hagari and Nandyal. Owing to adverse season the four strains under trial at Hagari behaved poorly and no comparative tests could be made this year.

In a comparative trial of selections at Nandyal, N. 23/10 did best, and it is therefore intended to give it out for trial in the coming year. It possesses sweet fodder quality and matures earlier than T. 6 which has been the strain so far in the field. Nearly a thousand units in the different varieties of sorghum were dealt with at the Millets Station at Coimbatore. Two strains in summer sorghum A.S. 809 in yellow and A.S. 1575 in white having been found to be the most superior have been handed over to the District Officer in Coimbatore for trial on ryots' lands. Five varieties noted for fodder were also under trial.

In the character studies made at Nandyal it was learnt that the popular opinion that dull midrib is associated with sweet stalk and white midrib with pithy stem is not of universal application. Some of the cross over types with white midrib and sweet stem have been isolated for further study.

At Hagari spacing experiments on sorghum in both grain and fodder varieties were under progress.

*Ragi*.—Two strains mentioned last year, E.C. 47 and E.C. 593, are being introduced in the Coimbatore and Salem districts, the latter shorter in duration than the former is becoming more popular of the two. It yielded at 2,648 lb. at the Central Farm, Coimbatore, as against 2,205 lb. of the local variety. In regard to scientific work on this crop, 640 units were handled during the year.

In the "time of sowing experiment" referred to last year, the results of one year show that the months of June and July are the best, the highest yields being obtained from crops sown during these months. The next best was the sowing in January, the poorest being March, April and November sowings.

At Anakapalle, where selection work has been going on for some years in this crop, there are 4 selections which are of promise. Of these, No. 525 in a trial plot in a ryot's land gave 16.4 per cent increase over the local ragi.

*Cumbu*.—Work on this important crop progressed, but being one easily susceptible to cross fertilization, the difficulties to contend with in its breeding are greater. It is proposed to make a cross between the *kattu cumbu* of Coimbatore with the Bellary variety to combine the tillering habit of the former and the large size of the earhead and grain of the latter. The Ganjam variety of *cumbu* continued to show its good qualities for both grain and fodder.

At Kovilpatti, not only *cumbu* selections are under trial, but progress is also being made in manurial, spacing and cultural experiments on it.

Preliminary work on the other minor millets, *Paspalum Scrobiculatum* and *Panicum Miliaceum* was under progress.

(b) *Paddy*.—Apart from the existing research stations at Coimbatore, Aduturai, Maruteru and Pattambi, it was possible to start another rice station in Ganjam, the funds for which are provided by the Imperial Council of Agricultural Research as a part of a scheme of research throughout the important rice-growing tracts of India helped to some extent by the Empire Marketing Board. A block of land of a little over 32 acres was taken on a five-year lease within the Berhampur Municipality.

As in years past, both economic and agronomic research progressed at all the breeding stations, as well as at the other agricultural stations where paddy is an important crop. The seed from the strains distributed during the year from the four breeding stations and from the Agricultural Stations of Anakapalle, Samalkota and Palur alone amounted to 140 tons sufficient to plant 15,680 acres,

a quantity all too small to meet the legitimate demands of the ryots. This, however, excludes the seed from seed-farms to which reference will be made in a different section. Arrangements have recently been made whereby each agricultural district officer in co-operation with intelligent and interested ryots would produce on the seed-farms a quantity that would be sufficient to plant several lakhs of acres with the improved strains.

At Coimbatore, the two *Anaikomban* strains to which reference was made last year have again done well for the fifth time giving 17 and 12 per cent increase over the standard. These two strains were under trial plots in ryots' lands in the Tinnevely district. Certain strains are being used as parents of some crosses. Among progenies of these, two are promising combining in them qualities of earliness and heavy yield.

It has been confirmed by a series of experiments that sterility of grain is associated with non-lodging nature of the straw, and that there is a strong relationship between tillering and yield and that the normal differences that exist in yield between different cultural and manurial treatments are due to the amount of tillering a plant is capable of putting forth under each treatment.

At Maruteru, 442 selections from among varieties of the Kistna and Godavari delta were under various stages of trial, while a large number of progenies of natural hybrids were under study some of which are showing great promise. In regard to the second-crop problem in the Godavari delta, it has been found that it is possible to advance the harvest of a crop by a month by adjusting the method of raising seedlings. Raising seedlings in the dry seems to enable them to withstand adverse conditions of the weather, but it will have to be done fairly early in the seed bed to advance the harvest.

At Aduturai a strain evolved from the first crop varieties is showing promise with an increased yield of 13.6 per cent over an average of four years. It is proposed to put it under trial plots in the districts next season. Of the long duration varieties, 54 strains were under trial, besides which 618 single plants from a large number of varieties from neighbouring districts were under study.

At Pattambi, hybrid progenies of *thekkancheera* and G.E.B. 24 are being grown with a view to combine the qualities of earliness of the former and fine grain of the latter. At Anakapalle, *navakoti sannam* among the varieties under trial yielded best at 3,785 lb. per acre. At Samalkota, among 20 paddy selections, *akkulu 6* has been found the most promising. At Palur, single plant selections are being continued in *swarnawari*, *chitrakali*, and *garudan samba*, while a beginning was made during the year in *jeevan samba* and *sinna samba*. In the semi-dry paddy trial *vankelu*, a Kurnool district variety ripening in 114 days yielded at 3,100 lb. per acre, which is 22.8 per cent increase over *vadan samba*. This is of great promise.

*Agronomic Research—(a) Cultural.*—In an experiment at Samalkota, it was demonstrated for the fourth time that for heavy paddy land as is obtained at that station, dry ploughing is detrimental; and that ploughing in cold weather is more harmful than after the showers in the monsoon. Experiments on spacing, topping and irrigation were under way at Maruteru and Aduturai.

*(b) Manurial.*—As in previous years, several experiments were laid down to test the effect of various manures on paddy. A comparative test with Kossier phosphate and bonemeal during the year did not show appreciable difference in results. The experiment will be continued for another year. At Samalkota, an experiment to test the effect of 1 cwt. of ammonium sulphate alone without a green dressing but in conjunction with 2 cwt. of superphosphate as opposed to a basal manure of superphosphate alone showed an increase of 4.5 per cent in grain and 20.3 per cent in straw in favour of the former, while another, with the addition of 78 lb. of sulphate of ammonia to the basal dressing of 2,000 lb. of green leaf and 2 cwt. bonemeal while giving no increase in grain, gave a statistical increase of 14.9 per cent in straw. At Maruteru it was learnt that the best time for the application of ammonium sulphate was about a month after the planting of the crop, while for Aduturai conditions it was a month later. At Anakapalle when green manure was applied there was an increase of 20.6 per cent in its favour as against no manure.

With prices of paddy at a low ebb and with little prospect of their getting any better, especially in view of the competition with Burma paddy, trials have been going on at all paddy stations to try substitute crops. Sugarcane, plantain, ragi, gingelly, fodder sorghum, groundnut and Cambodia cotton are some of the crops that have been under test in rotation with paddy. Some of them are hopeful but the one that seems to give out the best promise is the trial at Maruteru of Cambodia cotton which was raised in December and irrigated for two months only. It happens that there is canal water available just in those two months which at present is running waste to the sea as it is not enough for a paddy crop. If therefore the cultivation of Cambodia cotton is taken up by ryots, vast stretches of paddy land of the Godavari delta now lying idle in the second-crop season can be brought under cultivation with this remunerative crop. Further trials are under progress.

## (2) Fibres.

18. The only important fibre crop on which the department is bestowing attention is cotton. Besides the Cotton Station at Coimbatore, the Agricultural Research Stations, Guntur, Nandyal, Hagari and Kovilpatti, are concerned with research on this crop. Further selection work is in progress on Cambodia cotton; Nos. 67 and 75, two new strains, were compared with Co. 2, the present popular type. No. 67 was earlier and better, but the difference in yield as compared to Co. 2 was not nearly so good. In regard to dry cotton, 7 strains—*Indicum* crosses with *roseum* and *cernuum*—



were compared with *Karunganni* but did not show their superiority, probably owing to bad drainage. On black soil *Karunganni* 546 was not only superior to C. 7 in yield but was also earlier in duration and finer in quality than the latter. At Hagari several single plant selections were made for the first time on Cambodia cotton raised dry. At Nandyal five strains were found distinctly superior in yield to N. 14 but not as good in quality. Selection work progressed on similar lines on Cambodia and Cocanadas at Guntur and on *Karunganni* and Cambodia cottons at Kovilpatti.

Agronomic studies consisted in finding suitable rotation crops for cotton, groundnut and ragi being added to the present list. Groundnut raised before cotton increased the yield of the latter by 46 per cent over the cultivation of cholam and 23 per cent over raising ragi, the two popular rotation crops of the district. These are but one year's results but provided the ryots take precautions to grow enough grain and fodder for their needs, groundnut bids fair to be a crop that would successfully improve the yields of cotton. Last year reference was made to the experiment of early sowing of Cambodia cotton at Avanashi. A similar experiment made this year at the same place again proved the advantage of sowing Cambodia about the middle of September instead of waiting till the third week in October. There was an increase of 26 per cent in yield as against 37 per cent last year. A similar experiment on Cambodia cotton was started at Guntur for the first time. A manurial experiment laid down three years ago at Coimbatore to determine how far the application of nitrogen alone or in combination with potash or phosphoric acid will increase the yield of Cambodia cotton, showed that to fields receiving cattle manure frequently the need for its application was not evident, but in sandy soils the crop responded to the application of nitrogen alone in 2 out of 3 years. Experiments at Coimbatore and Nandyal on the direct and indirect manuring of cotton with ammonium sulphate and superphosphate showed that manuring cotton indirectly was preferable to manuring it direct.

The schemes financed by the Indian Central Cotton Committee are the Madras Herbaceum Scheme, Pempheres and Physiological Scheme and the one to determine the causes for the harmful after-effects of fodder sorghum on cotton. With regard to the first, experiments so far conducted among the several herbaceum strains showed that none of them is superior to *Karunganni*. *Karunganni* is being therefore crossed with *Uppam* and *Nadan*. The second scheme is concerned with the investigation of the causes for the variations among certain strains in the degree of attack of stem weevil, of breeding strains immune to its attack, and of the factors responsible for the shedding of buds and bolls of cotton. Though this study was projected several years ago it took shape only this year and the necessary staff and equipment were obtained in December. Before the year closed it was possible to make a good start and of all the information that could be obtained, the most interesting is with reference to gall formation at the base of the

affected plant which is found to be a protection the plant provides for itself against the complete destruction by the insect. In regard to the third scheme soil moisture determinations up to 4 feet showed that plots that grew sorghum contained least moisture when compared with that of cumbu and horsegram. It was, however, learnt that this deficiency of soil moisture was not the cause of the pale and poor growth of cotton in the plots which succeeded sorghum. Other causes seem to be at work and these are under investigation.

### (3) Fodders.

19. In a country where cattle depend in the main on bulky fodder crops and grasses, any work that could be done to improve their quality and augment the supply would be a step in the right direction. A passing mention has been made of the study of fodder grasses under the section of Botany. A beginning has been made at Coimbatore by raising 50 species of important South Indian grasses in small plots for purposes of study. A careful selection of the promising ones will be made and grown in larger areas to make a comparative study. There are valuable grasses, which if they could only be grown under careful management, would increase the fodder supply. *Kolakattai* (*Pennisetum Cenchrroides*), a grass found commonly in the Coimbatore district, could with advantage be spread in different parts of the country where similar dry conditions exist. At the same time on the West Coast where nature is lavish only in certain parts of the year when large quantities of grass could be found, steps should be taken to convert the excess grasses into silage and thus tide over the long spell of dry weather from January to May when cattle have little or nothing to eat. Reference was made last year to the different grasses grown at the Agricultural Research Station, Nanjanad. A manurial experiment was tried here with different quantities of several artificial manures. Although the manured plots were greener than, and cattle preferred them too, the unmanured plots, there was no appreciable difference in growth. Another manurial experiment on pastures started at the Livestock Research Station, Hosur, with sodium nitrate applied during different months of the year gave no decisive results, the droughty weather contributing to vitiate the effects. Farmyard manure applied to pastures at 10 and 20 cart-loads every year and in alternative years indicated that the annual application of 10 cart-loads per acre was the most beneficial.

At some of the other agricultural stations, different fodder grasses and crops were under comparative trial.

### (4) Fruit.

20. Fruit is becoming more and more an article of diet in the middle-class families of the Presidency. While this is what it ought to be, the aim should be to make growing of fruit so profitable and yet in such abundance that it would be within easy reach of the man-in-the-street. To this end, the various agricultural

stations have been of late raising different kinds of fruit with a view to learn the economics of such crops while a certain amount of research work is in progress on the two important fruits, plantain and orange. At Samalkota the study on the four varieties of plantain mentioned in last year's report was continued. The effect of restricted irrigation observed on the crop revealed that it retards flowering, reduces the weight of the bunch, and while hastening ripening, it affects the keeping quality.

An exhaustive survey of any particular crop to take stock of the material at hand is essential before we could explore its economic possibilities, and to this end a survey was undertaken by the Systematic Botanist in the chief plantain centres on the West Coast and Northern Circars. The survey included the description of 56 varieties, a large number of photographs and coloured paintings of which were taken. There are immense possibilities for the study of marketing such a valuable crop to North India where fruit is sold at high cost, while the field in hybridization of different varieties combining keeping qualities of one and taste of another is still unexplored. Though the latter is admittedly difficult, it is by no means impossible to attain.

At Anakapalle, a beginning was made in starting an orchard where different varieties of citrus were planted. Over a thousand seedlings were raised for planting and distribution. The three fruit stations on the hills continued to function on the same lines. At the Pomological Station, Coonoor, 565 peach seedlings were budded with varieties of peach and plums of which 369 were successful. Two hundred fruit trees in four different kinds were grafted and 1,750 seedlings were raised at Kallar. During the year 2,160 fruit trees and economic plants, 199 seedlings and 196 ornamental plants were distributed. The total outturn in fruit of all kinds amounted to 25,166 lb., as against 19,914 lb. in the year previous. The yield of mangoes was the highest on record, at 4,053 lb., from 19 trees as against 1,583 lb.—the average of five years. The value of the year's crop was a thousand rupees. The area under this valuable tree is being increased.

#### (5) Oil Seeds.

21. The Oil Seed Specialist took over the control of the groundnut station of Palakuppam, and the coconut stations of Nileshtar I—III and Kasaragod from 1st August 1931, and the staff connected with these stations was transferred under him. In view of retrenchment, it is found difficult to provide him with adequate staff and laboratory equipment.

(1) *Groundnut*.—There were 53 varieties under trial, of which 23 have yielded significantly better than the local mauritius, some even as much as 50 per cent. Further selections were made and 20 new varieties from foreign countries were obtained.

Under economic studies, the spacing trials were continued for the fourth time and the average results showed that the correct spacings for bunch and spreading groundnut were 6"×6" and

9" × 9" respectively. A cultural experiment to determine the advantage of flat, furrow and ridge methods of planting was vitiated by rains which levelled up furrows and ridges. The experiment will be continued on irrigated land. It is the practice in parts of South Arcot continuously to grow groundnut on the same land without manuring it. To test this practice with the more rational one of manuring groundnut every year with 5 tons of village rubbish, an experiment was laid down four years ago. It is found that on the average there has been no appreciable fall in the yield of unmanured plots but in years of scanty rainfall the difference in favour of the manured plots was greater apparently due to their greater moisture-retaining capacity.

Studies on flowering, pod formation, shelling, germination, and inheritance were continued.

(2) *Coconut*.—Research on coconut is confined to the three stations, Kasaragod, Nileshwar and Pilicode on the West Coast. A study of nuts revealed that (a) in relation to season of picking those picked in hot weather were bigger in size than those harvested in other seasons, and (b) the yield depends on the combined effect of the rains of two north-east monsoon periods and one hot weather, a period of 13 to 14 months. Other observations in the study of coconut were that poor yielders respond to manuring better than good yielders, that ashes alone or a mixture of ashes and ammonium sulphate are the most economical of the manures tried and that clean cultivation is even of greater importance than manuring in the case of coconuts raised without irrigation.

(3) *Gingelly and Castor*.—Varietal trials and flower studies were under way on these crops.

#### (6) Root Crops.

22. *Potato*.—The area under potatoes on the Nilgiris is about 10,000 acres, and in money value it runs into lakhs and is as important as coffee, though it is similarly restricted in distribution. There are three seasons, the main from April to August with a cultivated area of about 7,000 acres, the second crop between September—January with an area of 3,000 acres and a small crop early in the year under irrigation whose area is limited to a few hundred acres. If facilities for irrigation could be offered the area under the last could be increased up to a thousand acres, the seed of which could be utilized for the second crop. The yields for the main and the second crops were 6 and 3.92 folds respectively as against 4.3 and 4.8 last year, while the early crop gave 4½ folds as compared with 5 folds of last year. Manurial experiments on potatoes showed that the present application of concentrates consisting of superphosphates, sulphate of ammonia, bonemeal and sulphate of potash in addition to groundnut cake are suitable. As rotation crops with potato, *samai*, maize, wheat and barley are grown. Unfortunately none of these seem to do well and causes for their failure are under investigation.

## (7) Spices and Condiments.

23. (1) *Pepper*.—The season was so unfavourable that only 715 lb. of dry pepper were gathered, the yield being one of the lowest on record. This year's observations confirmed the previous ones that *kalluvalli* is the best variety suited to the locality. The manurial experiment on pepper started last year was continued. Other investigations were with reference to the disease known as *pollu* (*Colletotrichum necatar*) due to a combined attack of fungus and flea beetle.

(2) *Chillies*.—A manurial trial on two varieties, one from Malabar and another from South Kanara, were initiated at the Agricultural Research Station, Taliparamba.

To test the local opinion in the Guntur district, where chillies are extensively grown, that continuously growing them on the same land without rotation not only increases the yield but it also improves the soil fertility, an experiment was started this year. The experiment to control thrips on chillies was continued by the Entomologist. As this is a serious pest on chillies, it is proposed to evolve thrip resistant types.

## (8) Sugarcane.

24. Research work on this crop is confined to the Agricultural Research Stations, Anakapalle, Samalkota and Palur, and proceeded on the same lines as before. As many as 46 varieties were under trial at Anakapalle which included seven of the best sorghum-sugarcane crosses evolved by the Imperial Sugarcane Expert. Among the medium canes obtained from the same officer, Co. 213 offers the largest promise. It was successfully grown with only one irrigation at the time of planting and gave on a five-year's average an increased yield of 40 per cent over 247-B, the standard cane. M.A. 21, a seedling cane produced at Anakapalle though poor in germination, is an excellent drought resister and yielded over 40 tons of cane per acre in the four-year trial. These two varieties are now released for trial under the conditions of the ryot. At Palur, a trial of some of the promising seedling canes obtained from the Imperial Station, Coimbatore, showed that P.O.J. 2878—the wonder cane of Java—gave the highest yield at 12,798 lb. of jaggery per acre, closely followed by Co. 283 and Co. 281. P.O.J. 2878 at Samalkota proved to be a good drought resister, and an early maturer. A large number of seedlings obtained from the Imperial Sugarcane Station, Coimbatore, was distributed to several agricultural stations during the present season for propagation and trial. Sugarcane-sorghum cross evolved by the Imperial Sugarcane Expert and under trial in some farms is expected, if successful, to revolutionize the system of sugarcane cultivation of the Presidency in view of the fact that its period of growth is no longer than that of a long duration paddy crop while it possesses the advantage of being much more remunerative than paddy.

A spacing trial in sugarcane indicated that for conditions obtaining at Anakapalle, a spacing of 4 or 5 links apart was the best which meant besides a saving of 5,000 to 8,000 setts per acre, a reduction in cost in trenching, irrigation and other cultural operations. By restricting irrigation, the maturity of cane was hastened at Samalkota.

A manurial experiment to test the relative merits between groundnut cake and ammonium sulphate yielded little difference at Anakapalle, due probably to the deposit of silt during the floods of this year. Under Samalkota conditions, the application of cake alone yielded poorest while the application of ammonium sulphate alone gave the highest yield corroborating previous experience. At Palur on the other hand, the application of 200 lb. nitrogen as groundnut cake gave the maximum yield. The larger the proportion of ammonium sulphate in the manure, the worse was the keeping quality of jaggery.

In the rotation experiment that has been in progress for several years at Palur, cultivating sugarcane once in three years on the same land, was found the most economical.

An experiment laid down at Taliparamba to test the effect of mosaic disease on sugarcane indicated that there is a loss of 10 per cent in tonnage, that the percentage of sucrose is appreciably reduced, and that while the glucose ratio is slightly increased, the value of brix is lowered.

#### *D.—Entomology.*

25. In a country where crops fall an easy prey to various insect pests, the section of Entomology should be one of the most useful to the ryot. To this end and with a view to save delay, assistants in Entomology were placed under the direct control of several Deputy Directors, so that they could attend to the calls of the ryot immediately. Besides the advice given by these officers, the section directly dealt with 300 enquiries from different parts.

The special investigations conducted during the year included those on the rice grasshopper, the paddy stem-borer, the paddy mealy bug, the Deccan grasshopper and the thrips on chillies. In Ganjam where the rice grasshopper was most serious, a survey was made to gauge the approximate loss caused by the pest in bad years and to form an idea of the various factors that contribute to these periodical visitations. The survey showed that the pest is responsible for a 10 per cent damage to the paddy crop in the district and that though fairly well distributed it is specially confined to low-lying areas. As a measure of retrenchment, the Government have disbanded the special temporary staff appointed in 1930 to deal with the situation. The same pest which is making inroads into the Vizagapatam and South Malabar districts, by a campaign of successful demonstration has so far been kept under bay. Light traps for the paddy stem-borer have borne remarkably good results

at Aduturai. The attack of the Deccan grasshopper has been most noticeable in the Adoni taluk of Bellary district, but traps locally made have yielded very fruitful results.

Hairy caterpillar, against which the Pest Act is under operation in parts of the central districts, was present in only a mild form in parts of Salem and the Arcots, but as is often the case with it, it appeared in unexpected quarters like Tirukkoyilur and Tiruvannamalai taluks which had not been brought under the Pest Act.

The special staff employed to keep the coconut caterpillar under control was disbanded under orders of Government.

The cochineal insect, the natural enemy of prickly-pear, has much attracted the attention of the public, as scaremongers spread all manner of stories concerning its danger to other plants and human beings. A press note at the right time helped to allay the panic.

A very interesting and promising line of work undertaken by the section was the starting of an apiary at the Insectory with *apis indica*, the common Indian bee. Bee-keeping will not only be of educative value to students under training but as a cottage industry among ryots it has large possibilities. At the end of the year there were 20 colonies. When more information on its economics is obtained, it is proposed to have an apiary at each agricultural station from where it would be easy to demonstrate bee-keeping to ryots. An improved honey extractor made by the Research Engineer worked very satisfactorily.

#### E.—Horticulture.

26. The Botanic Gardens at Ootacamund and the Sim's Park at Coonoor are the centres of attraction to visitors and residents alike on account of their beauty and orderliness. The variegated flower beds and borders and the green lawns continually offer to the weary visitor from the plains the needed restfulness, while a visit to the conservatories is in itself an education to those interested in botany. A count taken on a day in April of the number of visitors to the Botanic Gardens at Ootacamund reached the high figure of 2,000 which bespeaks their popularity.

During the year 17,850 plants were propagated from cuttings, not to mention the innumerable number of plants potted. Forty-two new plants and bulbs were introduced into the gardens, besides several new annual flowering plants. The gardens were as usual presented with a large number—this year 2,580—of plants and seeds by several ladies and gentlemen. At Coonoor, a number of magnolias were grafted on to *micholia nilgirica*, both belonging to the same natural order. If this experiment proves a success, the method of raising of magnolias, a difficult task at present, will be facilitated. The receipts from the gardens amounted to Rs. 3,044 as against Rs. 4,654 last year due to a temporary stoppage of the sale of flowers and seedlings.

During the year, the public parks, Stonehouse Hill, the Sub-divisional office compound and the St. Thomas' Cemetery were transferred from the control of the Curator to their respective departments.

#### *F.—Implements.*

27. The Research Engineer was engaged during the year in testing various types of ploughs, a Persian wheel water lift, a groundnut decorticator, a portable thresher, and a roller bearing mhote wheel supplied by different firms of agricultural machinery. He manufactured a bund-forming implement which from the tests made causes considerable saving in time and labour in the operation, besides reducing the cost per acre by one rupee. The implement is estimated to cost Rs. 10 and should be within the reach of the ryots. Further trials were made with the improved circular mhote and seed drill to which reference was made last year.

Wind velocities observed at nine of the agricultural research stations indicated that the conditions in several districts, according to the Research Engineer, are favourable to the use of wind mills for domestic purposes as well as for irrigation of small gardens.

A cinema film of 1,000 feet was prepared by the Research Engineer as a preliminary trial to see if the department could have its own equipment for propaganda purposes when conditions improve. The local talent was utilized in developing, printing and projecting the film at moderate cost. A cinema film could, with advantage, be used in the motor exhibition vans for delivering popular lectures while at the college it would be of immense benefit to the students. The present method of lecturing with lantern slides is not only out of date but ineffective in arresting the attention of rural crowds for any length of time.

#### *G.—Livestock.*

28. The three livestock research stations at Hosur, Chintaladevi and Guntur continued their activities on similar lines. The chief breeds on which work is being done are the Kangayam, Ongole, Scindhi, crossbreds and buffaloes. The total number of all the cattle was 897 as against 964 in the previous year, besides the 7 breeding bulls at stud in Madras.

The various herds of cattle in which work is being done and the kind of improvement aimed at are described below :—

(a) A herd of crossbreds between Ayrshire bulls and Scindhi and Sanewal cows, the object being to build up a herd of good milking cows producing cattle of good constitution. Experience so far gained goes to show that in such cross-breeding the resultant first generation is good in milk production, whereas the second and third generations get deteriorated, both in size and milk. The daily average milk from each generation is respectively 15.5, 13.4 and 11.9 lb.



(b) A mixed herd of crosses known as the Coimbatore herd, in which the imported blood is of varying proportions ranging from  $\frac{1}{4}$  to  $\frac{3}{8}$ . With the object of gradually bringing them back to the Indian type, these cows are invariably served by the Scindhi bulls. The best of these cows are retained at Coimbatore for use in the dairy. The herds at Coimbatore and Hosur yielded on the average 16.7 and 9.7 lb. of milk per day per cow. Cow No. 177 referred to last year is still the best milker, yielding 11,534 lb. in her last lactation, with a daily average of nearly 30 lb.

(c) A herd of Ongole cows maintained at Hosur and Chintaladevi. Those of the former place yielded on the average 9.7 lb. and of the latter 12.2 lb. of milk per day. Two cows of this herd have broken the record by yielding 21 and 26 lb. of milk a day on the average. The improvement of stock by careful selection has resulted in the increase of milk of the farm-bred cow by 852 lb. in a lactation or 1.7 lb. per day. Though the increase appears small, the extra milk obtained by each cow is worth Rs. 100, a sum by no means insignificant especially when one takes into consideration a herd of such improved stock.

(d) A herd of Scindhi cows maintained at Hosur noted for high milk yield with a propensity for breeding regularly. These are maintained to improve also the West Coast cattle. The daily average of milk of the herd was 11.8 lb. per cow, although some individual cows gave on an average 15-17 lb. per day.

(e) A herd of Kangayams kept at Hosur to produce good breeding bulls to meet the demand from various parts of the Presidency. Cows of this breed are poor milkers.

(f) A herd of Delhi and crossbred buffaloes stationed at Guntur for the purpose of improving the milk and size of the country buffalo. The daily average of milk of the herd was 12.5 lb. A pure Delhi and a three-fourth-bred she-buffalo gave 16.9 and 14.5 lb. of milk per day, respectively. There is a growing demand for bulls and she-buffaloes from different parts of the Presidency.

*Breeding bulls.*—Including those maintained at Madras, for which there is a large demand, there are in the Presidency 128 distributed to co-operative societies, veterinary hospitals, private individuals, agricultural stations, etc., maintained for stud purposes. Of these, 72 bulls received premia from Government towards the cost of their maintenance.

*Sheep.*—A small flock of Bellary breed is maintained at Hosur to evolve a white breed producing good mutton and wool. The average wool yield was 2 lb. 12 oz. similar to last year, but the best yield was from a ram giving 6 lb. 12 oz.

Pigs are maintained as a side line both at Hosur and Coimbatore, the demand for which is increasing especially in the Coimbatore district. Seventy-four animals of different sizes found a sale.

*Poultry.*—To the three breeds already existing, breeding pens of Chittagong, Malabar and Black Minorcas were added, the total number of birds being 462. The total number of eggs laid was over 9,000, more than half of which were utilized for setting. The average number of eggs laid per bird at Hosur was 149 while at Coimbatore it was 126. The work on poultry breeding has increased in view of the demand from the public.

#### *H.—Mycology.*

29. The section of Mycology is concerned with fungus diseases affecting plants, and as in the case of the Entomology section, some of the staff was transferred to several circles under the respective Deputy Directors to deal with the diseases on the spot.

Paddy blast was under investigation. Among varieties possessing high resistance to the disease are G.E.B. 24, Co. 1 and Co. 4, while A.E.B. 3, Co. 6 and Aduturai 2 are highly susceptible to it. It was also learnt that the application of heavy doses of nitrogenous manure makes the plants more susceptible to disease, while potassic and phosphoric manures exercise a slight restraining influence. For footrot on paddy, seed treatment with 2 per cent copper sulphate for 30 minutes and hot water at 55 °C and 60 °C for 15 minutes were found most effective. In regard to varietal resistance to this disease, G.E.B. 24 was absolutely immune to it. Mosaic disease on sugarcane also received attention and it was found that varieties Co. 213, E.K. 28, Fiji B, B. 208 and 247-B were highly susceptible to it.

Other diseases on which research was done during the year were seedling blight and bollrot on cotton, and wilt on groundnut, plantain, redgram and betel vine. In regard to the last, the disease is prevalent in the neighbourhood of Poonamallee in Chingleput district, where excessive watering, defective drainage and absence of rotation are the rule. It was found that spraying does control the disease, but its effect is vitiated by the crude methods of irrigation followed. A good deal of demonstration and propaganda seem necessary to make the betel-vine growers change their present methods of cultivation. Preliminary experiments are under way at the Agricultural Research Station, Palakuppam, on clump disease of groundnut. Budrot of palmyra made its appearance in the Palghat taluk. Remedial measures which are well known are being demonstrated to the ryots.

#### *I.—Trial Plots.*

30. The purpose of the trial plots was explained fully in last year's report. Suffice it to say that these are the connecting links between research at the agricultural research station and demonstration in ryots' lands. Trial plots, though conducted under ryots' conditions, being only preliminary trials, require all the precautions necessary for conducting experiments at the agricultural station.

Not less than 120 trial plots were conducted throughout the Presidency on paddy, ragi, sorghum, sugarcane, cotton, tobacco and groundnut. Comparative manurial trial on Kossier phosphate and bonemeal on paddy in the III, V, VII and VIII circles showed practically no difference between the effects of the two manures. In regard to varietal trials on paddy, Aduturai 8 and 10 in the V circle showed an increase of 10 per cent, Aduturai 3 and 4 in the VIII circle gave an increase of 6.5 and 6.9 per cent, respectively, while A.K. 7 and 34 gave in the I circle an increase of 25 and 15 per cent, respectively, over their standards. In ragi, No. 525 evolved at Anakapalle gave an increase of 16.4 per cent over the bulk, while E.C. 593 gave an increase of 5-15 per cent in Coimbatore district and 6.6-33 per cent in Salem district. Manurial trials on Cambodia cotton, tobacco and groundnut yielded results of varying success. As may be expected, some of the trial plots did not show the expected advantage and will be continued until a decision could be arrived at.

#### V.—DEMONSTRATION.

31. This is the second year of our experience in the change of policy in demonstration methods, namely, in regard to the concentration of demonstration work in a few selected villages. It was hoped to take stock of our experience at the Gazetted Officers' conference, last December which, however, could not be held owing to financial conditions. There were 507 centres of work in which the demonstrators concentrated their activities. Though it may perhaps be admitted that progress achieved so far is not commensurate with the energy and time spent at each centre, there is no gainsaying the fact that the output of work accomplished was undoubtedly considerable in regard to certain items of propaganda, like, for example, in the endeavour to increase the manure-supply of the cultivator and in the demonstration of efficient methods of ploughing. Personal contacts were constantly renewed between the ryot and the demonstrator and in order to enable the latter to understand more thoroughly the economic position of the former, village surveys were undertaken in some of the circles. This will give a clue to the business side of farming, which is all important when dealing with individual ryots.

#### A.—*Demonstration Plots.*

32. As in the previous year, the demonstration plots were mainly confined to the centres of work and totalled 2,132. The demonstrations related chiefly to specific items of improvement on crops like paddy, sugarcane, ragi, groundnut, fruit as well as on money crops such as tobacco, onion, etc. The fundamental items included demonstrations in ploughing, intercultivation, manures and fodders.

*B.—Exhibitions and Shows.*

33. The help of the department is invariably invoked on occasions such as Co-operative and District Conference, Health and Baby Week Celebrations, etc., opportunities which are as far as possible utilized for arranging exhibitions. Besides these, the various village fairs, festivals and jamabandi camps are taken advantage of for conducting smaller shows when an opportunity is offered to rural people to come in contact with the work of the department. There were on the whole about 150 such exhibitions and shows as against 100 in the year before. Advantage is taken of such occasions to deliver popular lectures, preferably with lantern slides and no less than 550 lectures on agricultural subjects were delivered by the demonstration staff.

The three motor units continued their itinerary throughout the Presidency except in the Nilgiris, spending about four months in each circle. Officers of the Veterinary, Fisheries, Industries and Public Health departments co-operated with this department by accompanying the vans and bringing to the notice of the ryots the propaganda activities represented by the departments concerned.

*C.—Items of Propaganda.*

## (1) Crops.

34. (a) *Methods of Cultivation.*—In regard to reduction of seed rates in sowing, the chief crops concerned are paddy and sugarcane. In the case of paddy, the improvement is being demonstrated for several years and in a number of districts considerable reduction has been effected. The seed rate employed, however, varies from district to district. The Vizagapatam district is an extreme case in point where sowing 1,500 lb. of seed per acre of seed-bed is not an uncommon practice as compared with its neighbouring district of Godavari where one-fifth the quantity of seed is considered sufficient. Again in the Trichinopoly and Coimbatore circles the reduction aimed at is from 100 lb. to 50 lb.

Though transplantation is the rule in paddy, the number of seedlings put into each hole varies. Planting them in twos and threes has been recommended by the department for years, so much so that this practice is naturally spreading in different circles. While the time-honoured plough employed in ploughing wet lands is the wooden one, as the department by experiment and demonstration has shown to ryots that an iron plough would do the work better and quicker, the employment of iron ploughs is becoming quite common in several districts. There are, however, districts like the Tanjore where owing to the sticky nature of the soil the practice is not likely to spread. Added to this is the excuse of the ryot that his cattle are puny, a state of affairs which is in his own power to remedy. In such cases, dry ploughing of nurseries is being recommended and is receiving a fair response.

In regard to sugarcane, improved methods of cultivation include line planting, trenching and wide spacing. The practice of planting sugarcane in lines is increasing in the I circle, while wide spacing is becoming popular in this and the III circles. In parts of the IV circle the practice of planting cane 3 feet wide between rows has become the rule, no advice being now considered necessary on the part of the department. Ryots are in the habit of planting cane in shallow trenches, whereas the department considered deep planting is better as the canes have a firmer hold which would obviate lodging of the crop. To this end, the employment of different ridging ploughs are being recommended, especially in the III and IV circles.

By raising sugarcane seed from "short crop", i.e., using the immature cane as the planting material when the crop is 6 months old—a practice common in Java—it has been found in Vizagapatam that germination is improved by 10 per cent and yield by 15 per cent. This method is being made popular but the progress is slow for various reasons. In Hospet taluk of the Bellary district, planting cane from top setts, which give better germination, was demonstrated for the first time.

Drill sowing of dry crops, a practice common in the Telugu districts, has been introduced in the south. It has not, however, made much headway for the reason that in years of drought ryots cannot afford to lose time on receipt of a sowing rain and the operations of broadcasting and ploughing in, are made at the same time. Though this excuse seems reasonable at first sight, the difficulty could be overcome if ryots get into the practice of ploughing their lands early in summer, as soon as possible after harvest taking advantage of summer showers in which case it would be easy to drill straightaway on receipt of the first sowing rain. The area under drill cultivation in the VI and VIII circles amounted to a little over 13,000 acres. In the case of garden crops like Cambodia cotton dibbling seed in lines is being resorted to by the ryots of the VIII circle for the obvious advantages it affords.

Intercultivation of coconut though common in Malabar is not practised in the South Kanara. Through the efforts of the department 2,500 acres were so treated in the Kasaragod taluk alone.

(b) *Methods of manuring.*—Though the extent to which propaganda in improved methods of manuring progressed, will be discussed under the section on manures, a brief mention is made here of the crops and the manures to which the attention of the district staff was directed. Green manures supplemented by bonemeal or superphosphate for paddy, oil-cakes in conjunction with ammonium sulphate for sugarcane were recommended as before. In the I circle, *pillipesara* (*phaseolus trilobus*) was found most successful as a green manure for paddy; over 2,000 acres were put down to this crop. The manuring of fruit received attention in I, III, V and VI circles. Four demonstrations in

manuring potatoes in the VIII circle gave 27-50 per cent increased yields over local manuring. In the V circle, where there is a dearth of cattle-manure, demonstrations in better preservation of cattle-manure led to increase in its total output.

(c) *Seed Distribution.*—The outstanding line of activity of the various crop specialists of the department has all along been in the direction of evolving improved strains. The greatest progress made so far has been in the most important crops, cotton, paddy and sugarcane, though efforts on millets have so far brought material only in a limited quantity. The possibilities of making non-official agencies take interest in producing seed of their own under departmental supervision were explored during the year with fair prospects.

*Cotton.*—The strains of cotton distributed are four : Co. 2 (Cambodia), C. 7 (*Karunganni*), H.I. (Western) and N. 14 (Northern).

The greatest activity evinced in the production and distribution of Cambodia cotton strain was in the VIII circle, Co. 2 continuing to be the most popular strain under distribution. Through the efforts of the department 232,000 lb. of seed were distributed through the maintenance of seed-farms. Besides this, a few ryots of Gopichettipalayam and Pollachi whose cotton was ginned under the supervision of the department, kept for distribution among themselves over 79,000 lb. and the Tiruppur Trading Society distributed 76,000 lb. of seed. The sale price of lint was low this year which fetched for this cotton a premium of only Rs. 10 over market prices as against Rs. 20-30 obtained last year. The Co. 2 seed from Coimbatore found its way not only into other districts in the Presidency but over 2,200 lb. of it were in demand in other provinces. In the VI circle, over 35,000 lb. of the same strain were distributed including the quantity that was obtained from Coimbatore. The total quantity of seed distributed in the Presidency both by the department and ryots amounted to nearly three and one-third lakhs of pounds.

The production of *Karunganni* seed is in the main confined to the VI circle, though over a lakh of pounds of C. 7 were produced in the seed-farms of the VIII circle. Both the circles were responsible for the sale of 172,660 lb. while the Idaseval Seed Union in Tinnevely district distributed about 15,000 lb., the whole totalling nearly 188,000 lb. of seed.

In the Bellary district, H. 1 strain of the "Westerns" cotton continued to be distributed. The area of the seed-farms was limited to the quantity of seed required, but owing to the adverse season the yield was poor throughout the tract, in consequence of which the demand for seed by ryots was unsatisfied. It was, however, fortunate that it was possible to purchase sufficient seed from villages where the season was favourable. The quantity distributed amounted to a little over 246,000 lb. including the quantity issued to seed-farm ryots for sowing in the 1931-32 season. Two hundred and thirty-four bales of lint of ryots were sold with the help of the department at a premium of Rs. 10-15 per bale.

N. 14, a strain of the "Northern" in the Kurnool district continued to be distributed. Though a strain of excellent quality its yield is so low that in bad years it does not seem paying to grow it. Of a total quantity of 89,675 lb. of seed obtained, nearly the whole of it was issued to ryots including the quantity required for sowing seed-farms for 1931-32 season. On behalf of ryots, 145 bales of lint were sold at a premium of Rs. 35-40 per bale.

*Coconut.*—Improvements suggested in this crop are wide spacing, new varieties, intercultivation and manuring of gardens. The low price for coconut and the general economic depression militated against the extension of coconut cultivation on the West Coast; in spite of this, about 9,000 acres of dry land were planted with coconut, advice regarding selection of land being given by the department. A large number of demonstration plots continued to be run, several belonging to the district board, the maintenance of which was in the hands of the department. In the circle itself 5,087 seedlings and 3,920 selected seed-nuts were supplied to ryots. In the East coast, similar propaganda is being done in almost all the circles, nearly 2,700 seedlings and 2,100 seed-nuts having been supplied to ryots. In the V circle, in addition, 430 acres were intercultivated and 240 acres manured.

*Korai cultivation for mat-making.*—The Government in G.O. No. 1317, dated 3rd September 1931, ordered that a paragraph should be embodied in the administration report on the progress made on the growth of korai by this department in districts where the mat industry has been established. The cultivation of korai is restricted to certain localities in the II, III, IV and VI circles. The work done so far was mainly advisory and 1½ acres were planted with it at one village in the North Arcot district at the suggestion of the department.

*Paddy.*—Further progress in the spread of the strains evolved and the bulk selection made by the department is recorded, the total amount sold going up to 200 tons as compared with 160 tons last year. G.E.B. 24, one of our earliest strains, continues to stand unrivalled in popularity. Apart from reasons mentioned last year, the fact that it fetches a higher price varying from 12 annas to 1 rupee a bag is an additional reason for its popularity especially in these days when the price of paddy is ruling so low. It has now spread from district to district and has found its way even to parts of the Hyderabad State. In the IV circle, there was a bigger demand for Co. 2, a variety which would withstand late planting, owing to receipt of rains late in the season. The biggest achievement in the spread of paddy seed was in the V circle. The distribution of seed is through seed farms, co-operative societies and selected seedsmen who promise to sell half the produce to their neighbours. The seed produced at the agricultural stations, is reserved for multiplication of pure seed from year to year. It is a noteworthy fact that 16 lakhs of pounds of seed distributed was through the efforts of the co-operative societies and individual seedsmen. Over 2,000 tons of seed have been reserved for sowing

next season in the circle. On the West Coast, the Pattambi Agricultural station not being yet ready with the strains suited to the locality our activities are confined to issuing selected bulk seed. About 47,000 acres are said to be under departmental seed. Coimbatore strains, Nos. 1-7 and Adt. 3, 4, and 65 strains from Aduturai, continue to be popular in different parts of the Presidency.

*Potato*.—The distribution of potatoes without being confined to the Nilgiris, has this year been extended to the Salem district, over 3,000 lb. of seed from Nanjanad being sent to Hosur where it yielded 10-15 per cent higher than the local product. The demonstrators were responsible for the distribution of over 2,000 maunds in the Nilgiris some of which was intended for seed farms. The seed from Nanjanad has practically replaced the local seed.

*Ragi*.—In the Bellary circle, T-8 when introduced into the districts yielded in certain parts as much as 30 per cent increase over the local ragi, but in other parts in the same circle where irrigation difficulties exist, it is not spreading owing to its slightly longer duration, so that the goodness of a strain depends on various factors, yield alone according to the ryot not being the criterion. In the Coimbatore circle, H 22, a strain from Mysore, gave conflicting results yielding as it did 31 per cent increase in one taluk while in another it went below by 18 per cent. Nevertheless, it now occupies about 4,000 acres in North Salem. In regard to E.C. 47 and 593, the selection of the Millet Specialist, the former gave a 45 per cent increase in two places, while the performance of the latter was not uniform.

*Sorghum*.—Although about 6,400 lb. of seed of strains T. 1 and T. 6 were distributed in the Bellary circle, owing to adverse season these were practically failures in common with the sorghum crop of the tract. In the V circle, *peria manjal cholam*, a variety from Coimbatore noted for grain and straw, is being pushed in place of *irungu cholam*, a poor yielder. About 28 acres were put down to A.S. 1543 in the Coimbatore circle which showed but 5 per cent increase over the local. Two other strains, A.S. 1575 and A.S. 809 are under trial in the same district.

*Sugarcane*.—Reference was made in last year's report to the replacement, wherever necessary, of 247 B, yet the most popular cane in the Presidency, by better varieties. This variety continues its popularity in several districts for its drought resistance and good yield. It is a good tillerer but unfortunately in Chittoor district it has not caught on owing to the fact that during the process of wrapping all but the best 3 or 4 tillers are removed. Trial plots were laid out this year in this district to compare this variety along with some others.

The variety of outstanding promise brought to prominence this year is the medium cane Co. 213, evolved at the Imperial Sugarcane Station which has been for years under trial at the Agricultural Research Station, Anakapalle, and which has done remarkably well with but one irrigation at the time of planting. This,



along with some other varieties of the same type has been introduced not only in several of the agricultural stations but also in Vizagapatam, Bellary, Salem and Coimbatore districts under field trials under ryots' conditions. The successful growing of this variety will result in the reduction of cost in irrigation, manuring and propping and in the increase in output even under such restricted conditions. The fact that paddy is not as paying now as it used to be, has brought sugarcane to the forefront among crops grown as substitutes to it. In view of this, sugarcane varieties are being grown in almost all the agricultural stations where facilities exist for their propagation. One direct result of this is that, although in Malabar sugarcane is almost conspicuous by its absence, its introduction at the Agricultural Research Station, Pattambi, has tempted ryots in the neighbourhood to grow it in small plots. The successful cultivation of sugarcane on wet land at Aduturai will, it is hoped, help to spread it in the Tanjore delta.

### (2) Fodder.

35. The efforts of the department in bringing to the notice of the cultivators the important role good fodder plays in the improvement of livestock continued as before, and to this end fodder sorghum, *kolukattai* grass seed, guinea and elephant grasses, sunnhemp, and *pillipesara* were introduced, in different parts of the Presidency. The last, a leguminous fodder introduced but recently, has caught on in the I and II circles, so much so that it is being grown on canal bunds and Public Works Department porambokes of the I circle. Over 12,000 acres were put down to various fodders in this circle alone. The municipality of Madura which had some years ago started growing guinea grass in the sewage farm is said to make a net profit of Rs. 125 per acre proving the profitability of growing fodder crops in such localities.

On the West Coast, with its peculiar climatic conditions, the problem of over-production of grass at one time and its extreme scarcity at another, was met by teaching ryots to make silage and hay of the grasses during periods of abundance. Silage manufacture, a necessary adjunct to good fodder production, was demonstrated in the I, VII and VIII circles where 79 pits were constructed.

### (3) Fruit.

36. The chief fruits on which propaganda was done are plantain, citrus and mangoes, though assistance was afforded in regard to other fruits as well. In spite of the fall in prices of plantain, it was successfully cultivated in wet lands, nearly 1,200 acres being under it in the I circle. There seems to be an over-production in it in the Godavari district which resulted in dumping large quantities in Ganjam and Vizagapatam districts and reducing the area there. This could be avoided if transport and marketing facilities are created for their transport to North India. The Agricultural Research Station, Anakapalle, was responsible for the disposal of 1,200 seedlings of different sorts of citrus, while special

attention to the same fruit was paid in the III and IV circles. In the Vizagapatam district alone, at the instance of the district staff 18,450 grafts of mangoes were planted. On the West Coast where waste land is available, fruit cultivation is being encouraged, 26,367 seedlings and suckers having been distributed to cultivators.

Cashewnut, a crop hitherto hidden in obscurity, has of late come into prominence owing to its demand in America for purposes of confectionary. Its preparation for export has pushed all other agricultural industries on the West Coast to the background. The demand for unshelled nuts was so keen that they had to be imported even from East Africa. The extension of the area of cashewnut is receiving attention.

#### (4) Implements.

37. The Government in their Order Ms. No. 1751, Development, dated the 8th December 1931, did not approve of giving a monopoly to any one firm in the sale of their particular types of ploughs, unless its prices were appreciably low. The number of demonstrations conducted with different kinds of ploughs during the year rose from 2,000 last year to nearly 4,000. It is impossible to get at the correct number of iron ploughs purchased by the ryots, in different parts of the Presidency but, so far as the departmental figures go, the number sold is approximately 880.

Among other implements being extensively demonstrated may be mentioned H.M. guntaka, junior hoe, roll easy mhote wheel and seed drill. There were over 1,000 demonstrations with H.M. guntaka, both as a groundnut harvesting implement and a cultivator. Roll easy mhote wheels with which there were nearly 100 demonstrations are a great improvement upon the local wooden wheels in that they reduce friction and offer considerable relief to the bullocks at work. The sale to ryots of some of the important implements is as below :—

H.M. guntakas	..	..	54
Sugarcane mills	..	..	12
Chaff cutters	..	..	4
Mhote wheels	..	..	21
Digging forks	..	..	38

#### (5) Livestock.

38. Propaganda in this section related to proper feeding, exercise and housing of cattle and the use of breeding bulls of good breed and constitution for the improvement of the present condition of the cattle. As stated elsewhere in the report there were 72 bulls under premia, for which the owners received Rs. 4,391 during the year. Besides, those maintained in jails, Government farms and veterinary hospitals totalled 56. The demand for good breeding bulls is on the increase, but some of the bulls purchased from the department get into disfavour on the score that they are slow

servers, but ryots seem to forget that over-feeding and want of exercise are as bad for them as underfeeding and bad management. Another matter which is well worth bearing in mind is the fact that cows should be brought for service on the first signs of their coming into heat. Delay would result in ineffective service, for which the ryots concerned alone are responsible.

There has been a marked interest evinced by the public in regard to improvement of poultry. Some missionary institutions and private individuals are maintaining improved breeds of their own, while the department supplied during the year several hundreds of eggs of good breeds for setting as well as a few dozens of chickens.

#### (6) Manures.

39. If there is one item in which efforts of concentrated work in villages have begun to show signs of bearing fruit it is that directed towards the increase and improvement of the manure-supply of ryots. Agricultural demonstrators are endeavouring to strain every nerve to demonstrate to cultivators the various ways in which they could accomplish the object.

*Farmyard Manure.*—The sources of loss to which the present methods of preserving manure are subject were explained in the previous report. In some districts the practice of storing manure in pits is in vogue, but in such cases the defects are that the pits are shallow and the manure soon becomes a heap which is not covered. These defects are set right by demonstrators; in the case of localities where such a practice is non-existent, with the assistance of ryots themselves or their own maistris and messengers, demonstration pits are made. Taking as an example the Bellary circle, the district staff had 93 new pits dug while 2,278 old pits were set right. It may be stated that through the efforts of the department over 9,000 pits were maintained. Demonstrations in the proper maintenance of cattle-sheds are carried on simultaneously. Two thousand two hundred and seventy-four dry earth sheds and 112 loose boxes were constructed. The I circle can claim for itself the biggest achievement in this direction which takes credit for the maintenance of over 3,800 pits and 1,500 dry earth sheds.

*Compost.*—This refers to the preservation of all organic matter in the shape of waste litter, fallen leaves, stubbles, trash and weeds, which are at present either burnt or not taken care of. The method of its preparation needs no more attention than that of cattle-manure. Over six hundred and fifty compost pits were made at the suggestion of the department.

*Green manures.*—Sunnhemp, dhaincha, wild indigo, indigo and pillipesara continue to be the most popular manures among ryots. The kind of crop in demand depends on several factors among them being its availability, soil suitability, irrigation facility, etc. Crops which are not readily eaten by cattle, that could withstand draught and are easily grown are naturally preferred. *Pillipesara*

already referred to is making much headway in the Godavari delta as green manure, nearly 35,000 lb. of seed being produced there. Although attempts are being made to make each circle self-supporting in its need for green manures, certain localities seem to be particularly favourable for their production. Wild indigo in the V and VI circles, indigo in the III circle and dhaincha in the VIII circle are cases in point and are the sources of supply to the rest of the Presidency. The total quantity of all the green manures distributed to ryots amounted to 174 tons.

*Artificials.*—As in everything else, depression in trade had an undoubted effect on the sales of artificial manures, though it must be said to the credit of the district officers that through their instrumentality ryots are slowly learning the serious mistake of applying artificial manures to crops without the addition of requisite quantities of organic matter. Despite these facts, the manures continued to be popular for crops like plantain and sugarcane.

#### (7) Pests and Diseases.

40. With the exception of a few circles, the Deputy Directors were assisted by special demonstrators in Entomology and Mycology to combat with the various insect pests and diseases. The pests affecting paddy were grasshopper in the I circle, caseworm, mealy bug, hispa and stem borer which was widespread in the VI circle. Smut on sorghum was in evidence as usual in the dry tracts of the Presidency. Soaking the seed in a solution of copper sulphate has become a general practice among ryots. Bud-rot in palmyra took a serious form in the Palghat taluk of Malabar where two subordinates were detailed for taking control measures. The staff conducted 265 demonstrations and 283 trees were operated. The damage due to Rhinoceros beetle and Mahali disease on coconut was considerable on the West Coast. Other diseases which received attention were thrips and leaf curl on chillies, leaf spot on turmeric, and mildew on grape vine and oranges. Hairy caterpillar on groundnut, stem weevil on Cambodia cotton, *nephantis* on coconut, etc., will be dealt with under legislation.

#### *D.—Work through other agencies.*

##### (1) Co-operation.

41. Practically in every circle certain agricultural improvements were pushed through co-operative organizations. Through the Loan and Sale Society at Anakapalle it was possible to sell Rupees 30,000 worth of jaggery. The societies at Adoni and Tadpatri were concerned with sale and distribution of cotton while the Agricultural Improvement Society at Bantanahal in Bellary district and the ones at Polur and Revanur in Kurnool district did other agricultural work than merely dealing with cotton ginning and marketing. Arrangements were made in the IV circle to finance cultivation of groundnut and sugarcane through co-operative societies.

In the V circle, with the exception of two, all the co-operative agricultural societies functioned. They were engaged in multiplying and distributing paddy seed, securing manures to members, and maintaining breeding bulls. A special demonstrator placed at the disposal of the Co-operative Sale Society at Kovilpatti was helpful in grading and marketing cotton and stocking pure seed. A dozen co-operative societies in the VI circle purchased green manure and cotton seed and iron ploughs for distribution to its members. Several seed societies in the VIII circle engaged themselves in the distribution of cotton seed among their members.

### (2) Agricultural Associations.

A number of agricultural associations like the ones at Vizagapatam, Nellore, Trichinopoly and Coimbatore interested themselves in staging agricultural and industrial exhibitions while those at Vizagapatam and Chittoor and Palghat stocked and sold or lent agricultural machinery. The one at Trichinopoly extended its usefulness by instituting branch associations in rural parts and distributing a fair quantity of paddy seed. Three new associations were formed in Salem.

## VI.—LEGISLATION.

42. *Cotton Ginning and Pressing Factories Act.*—This Act continued in force during the year. The number of ginning factories in the year rose from 523 to 529 and pressing factories from 63 to 67. The number of cases of owners of factories prosecuted and fined for infringement of provisions of the Act fell from 20 to 7.

43. *Cotton Transport Act.*—This Act also continued in force during the year. The absence of restriction on the movement of cotton by road and river continues, with the result that the object of the Act is partially defeated, as Cocanadas cotton and that from the Nizam's Dominions get into the districts of Bellary and Kurnool; and Mysore and Malabar cotton is taken to Tiruppur. It is possible to replace the local inferior cotton in Malabar by superior cotton, and steps are being taken to this end. The general question of controlling irregular transport of cotton by road and river is engaging attention.

Import of cotton by rail and sea is allowed by licences issued under my authority.

*Single Licences by rail.*—Thirteen were issued against 5 in the previous year, of which ten were for import into the Southern area and three into the Northern area.

*Annual Licences.*—Eleven licences with certified copies of 328, were issued for use by mills in the Southern area against 10 licences and 240 certified copies in the previous year. Only 262 copies

were used against 192 of the previous year. The table below gives information about the licences issued from February 1931 to January 1932 :—

Cotton year 1931–32 (licences which lapsed on 1st February 1932).

Kind of cotton.	Number of licences issued.	Number of certified copies issued.	Number of certified copies used.
Ginned cotton .. ..	10	318	259
Cotton waste .. ..	1	10	3

Licences issued from 1st February 1932 to 31st March 1932—Cotton year 1932–33 (licences which will expire on 1st February 1933).

Name of the protected area.	Kind of cotton.	Purpose for which licences were issued.	Number of licences issued.	Number of certified copies issued.
Southern tract.	Ginned cotton.	Mill consumption.	12	213

*Import by sea.*—Eighty-seven licences were issued for the import of 49,675 bales of cotton into Tuticorin against 21 licences for 2,985 bales in the previous year. In both years, the import was mainly for one firm and was made from ports in the Bombay Presidency.

In the interests of the growers of cotton and the cotton trade, the Madras Legislative Council passed the Cotton Control Act, 1932, prohibiting the cultivation of, and the mixing of *pulichai* (*G. neglectum*) cotton and its trade.

44. *Cotton Market.*—A Bill to provide for the establishment and the better regulation of markets for commercial crops in the Madras Presidency has been under the consideration of the Government. A large volume of opinion has been received, both for and against the Bill. Under the orders of Government, I am investigating into the trade conditions at the several cotton centres where markets are possible, and also gauging the sentiments of growers and traders in the matter.

45. *Pest Act—Agricultural Pests and Diseases Act III of 1919.*—The Act was brought into operation in the year under review in respect of diseases and insects affecting cotton, groundnut, coconut, palmyra palm and also for the eradication of water hyacinth.

*Coconut.*—The operations under the Act in respect of the coconut caterpillar pest (*Nephantis Serinopa*) in South Kanara and Malabar districts were suspended with effect from 1st September 1931 and the temporary staff sanctioned in this connection was also disbanded. The Act has been in force for a sufficiently long period and the owners of the coconut gardens, it is believed, have realized the benefits of carrying out the control methods and understood their *modus operandi*.

*Cotton*.—The notification is in regard to the two insect pests, stem weevil and pink boll worm attacking Cambodia and *pachanadan* cotton in Coimbatore, Salem, Trichinopoly and Madura districts. There was delay in pulling out the cotton plants in all the districts except in Salem. The ryots are on the whole realizing, though slowly, the benefits of the working of the Act and have, of their own accord, removed the plants though with some delay in certain cases. In the V circle, the crop in some cases had to be removed earlier than the scheduled date owing to the long spell of dry weather, which made it wither and dry. The ryots in the VI circle had no inducement to keep the crop on the land as the season for the second picking was unfavourable.

*Groundnut*.—The Act was enforced against red hairy caterpillar pest (*Amsacta albistriga*) on groundnut and cumbu in all the villages in Voraiyur firka, Tiruvannamalai taluk, North Arcot district, in 8 villages in Vriddhachalam taluk, South Arcot district, in Andimadam and Manaputhur firkas and 20 villages in Udayaralayam taluk, Trichinopoly district. It was also introduced in Salem and Rasipuram taluks in Salem district with effect from 1st June 1931. The emergence of the moths was on the whole poor owing to the late outbreak of the monsoons. The agricultural demonstrators having jurisdiction over the areas carried out necessary propaganda work with the assistance of the entomological staff by lantern lectures and distribution of pamphlets describing the life history of the pest and induced the ryots themselves to carry out the remedial measures.

*Palmyra*.—The Act is in force in East and West Godavari, Kistna and Guntur districts. The agricultural demonstrators drew the attention of the owners whenever they came across diseased trees and explained to them the evil results that would follow if they failed to take remedial measures.

*Water Hyacinth*.—The Act is in operation in the districts of Ganjam, West Godavari, Kistna, South Arcot, Tanjore, Madura and Malabar for the eradication of the weed present in water sources.

## VII.—PUBLICATIONS.

46. The undermentioned leaflets and bulletins were published during the year 1931-32 :—

Subject.	Languages in which published.	Price.
<i>Leaflet Series.</i>		
24. Care and management of cattle manure in South India.	English, Tamil, Telugu, Malayalam and Kanarese.	Free.
25. Green manuring .. .. .	Do.	Do.
26. Revised note on tapioca .. .. .	Do.	Do.
27. Telugu songs on improved method of paddy cultivation.	Telugu .. .. .	Do.

Subject.	Languages in which published.	Price.
<i>Leaflet Series—cont.</i>		
28. Weeds, weeds, weeds .. .. .	English, Tamil, Telugu, Malayalam and Kanarese.	Free.
29. The sindhewahe furnace for jaggery manufacture.	Do.	Do.
30. Red-rot disease of sugarcane .. .. .	Do.	Do.
31. The mosaic disease of sugarcane .. .. .	Do.	Do.
32. The stem bleeding disease of coconuts .. .. .	Do.	Do.
33. Pure cotton .. .. .	English and Tamil.	Do.
34. Sprayers and spraying .. .. .	English, Tamil, Telugu, Malayalam and Kanarese.	Do.
35. Prickly-pear cochineal .. .. .	Do.	Do.
36. Bud rot of palmyras .. .. .	English, Telugu and Malayalam.	Do.
37. Mildew on grapes and how to prevent it .. .. .	English, Tamil, Telugu and Kanarese.	Do.
38. Water hyacinth .. .. .	English, Tamil, Telugu, Malayalam and Kanarese.	Do.
39. The Deccan grasshopper .. .. .	English and Telugu.	Do.
40. The swarming caterpillar of paddy .. .. .	English, Tamil, Telugu, Malayalam and Kanarese.	Do.
41. The rice bug .. .. .	Do.	Do.
42. The rice hispa .. .. .	Do.	Do.
43. Smut disease of cholam and thenai .. .. .	English, Tamil, Telugu and Kanarese.	Do.
44. Control of rice grasshopper in Malabar .. .. .	Malayalam	Do.

*Broad Hint Series.*

5. Sow good seed .. .. .	English, Tamil, Telugu, Malayalam and Kanarese.	Free.
6. Beware of weeds .. .. .	Do.	Do.
7. Feed and work your cow .. .. .	Do.	Do.
8. Dedication of breeding bulls of Ongole breed.	Do.	Do.

*Pamphlets.*

3. Notes on the results of chemical, entomological and mycological experiments conducted at the Betel Vine Station, Vellore, during 1925-30.	English, Tamil, Telugu, Malayalam and Kanarese.	Free.
4. Useful information obtained from ten years' work (1920-29) on the Agricultural Research Station, Samalkota.	English and Telugu.	Do.
5. Some common insecticides .. .. .	English, Tamil, Telugu, Malayalam and Kanarese.	Do.

*Handbills.*

Handbill on cotton .. .. .	Tamil .. .. .	Free.
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Subject.	Notes.	Languages in which published.	Price.
			RS. A. P.
4. Some suggestions to the ryots of the IV Circle to obtain and keep paddy pure.		English, Tamil and Telugu.	Free.
5. Note on ragi silage in Coimbatore district ..		English. Tamil and Kanarese.	Do.
6. Hints to the ryots of Trichinopoly and Tanjore districts for keeping up the purity of paddy seed.		English and Tamil.	Do.
7. Pure paddy seed, II Circle .. .. .		English and Telugu.	Do.
<i>Bulletins.</i>			
23. Grass farming in Coimbatore district ..		English and Tamil.	0 2 0 each.
24. Graft mango gardens and how to start and maintain them.		English (Vernacular editions in the press).	0 2 0
25. Insects affecting the paddy plant in South India.		English .. ..	0 2 0
26. Insects affecting tobacco in South India ..		Do. .. ..	0 1 0
27. Annotated list of the insects affecting the important cultivated plants in South India.		Do. .. ..	0 8 0

The Villagers' Calendar for 1931-32 was published as usual in English and the vernaculars. Fifty-five thousand seven hundred copies were printed as shown below for sale and distribution:—

English .. ..	5,500	Kanarese .. ..	2,600	
Tamil .. ..	22,100			
Telugu .. ..	18,500		Total ..	55,700
Malayalam .. ..	7,000			

The publication of the quarterly digest was discontinued as a measure of retrenchment.

#### VIII.—STATISTICS.

47. *Forecasts.*—The areas estimated in the crop forecasts in 1930-31 differed from the actuals by about 0.3 per cent for paddy, 1.6 per cent for gingelly and castor, 2.8 per cent for sugarcane, and 3.5 per cent for groundnut and cotton. The figures show that the estimates were judicious.

At the instance of the Empire Marketing Board, London, two forecast reports were instituted for pepper and ginger on the West Coast in September and January, the first showing the condition of the crops and the second their yield.

48. *Normal yields.*—The normal yield per acre of Tinnevelles cotton was reduced by me from 110 lb. fixed in 1918 to 103 lb. as a result of field trials and comparison with trade figures, viz., cotton received at presses and mills and consumed outside. The question of revising the normal yields of pepper and ginger is engaging my attention.

49. *Season and Crop Report (Annual).*—The year under report had the turn for the revision of normal areas of crops done triennially.

The forms of district statistical returns A-1 (total area), A-2 (area irrigated, etc.) and G (area under crops) were simplified as noted below. The areas under Government, zamindari, and inam hitherto shown separately were clubbed into one as the details were not found indispensable in practice. The column of estimates in all the returns was eliminated as the maintenance of accounts have been insisted on throughout the Presidency including non-Government areas, except in the Agency tracts. The important change in the recording of areas of mixed crops advocated by the Royal Commission on Agriculture was given effect to by the issue of detailed instructions to conduct crop-cutting experiments at the headquarters village of every agricultural demonstrator for all mixed crops, and to fix a ratio for each mixture for adoption in all the villages of his range by the Revenue Department.

Under the orders of the Government of India on the recommendations of the Royal Commission on Agriculture, a supplemental table showing details of forest area by ownership was added to the complete returns of agricultural statistics.

50. *Taluk and Village Accounts.*—Inspections of the accounts by the Statistical Assistant were made in six taluks of the Presidency and instructions issued on the spot for the proper maintenance of accounts. At my instance, the Board revised the form of the enclosure A to account No. 1 prescribed for estate villages, and also standardized all the forms of accounts, prescribed in the Manual of Village Accounts for estate villages. The firka and taluk registers and returns relating to forecast reports of crops were revised. The form and size of the registers and returns were also improved.

51. *Prices.*—The average wholesale prices for all the forecast crops were published from time to time in the forecast reports and finally in the annual season and crop report.

52. *Rainfall.*—The system of maintaining permanent registers of rainfall following the trend of monsoons for all recording stations in the offices of the Deputy Directors and District Agricultural Officers was started during the year and the figures are now available from 1920.

53. *Weekly cotton mill and press return.*—There were 25 cotton spinning mills in the year against 24 in the previous year, the one addition being in the Coimbatore district. These mills continued to be good enough to send their returns of cotton receipts every week. Likewise, returns from the 67 presses were continued to be received under the Cotton Ginning and Pressing Factories Act. A special statement of the exports of cotton by varieties to places outside the Madras Presidency during the last three seasons with countries of destination was compiled and sent to the Indian Central Cotton Committee at their request.

54. *Miscellaneous.*—The railway freight rates for the export of paddy and rice from Rajahmundry to Madras were found to be more than those from Cocanada which, being a sea-port, enjoyed

and the Rajahmundry merchants had to take concession rates via Cocanada, a circuitous route, to avail themselves of the concession. At my instance, the Madras and Southern Mahratta railway were pleased to remove this anomaly to some extent, levelling the rates.

The Statistical Assistant was deputed to enquire in the districts of East and West Godavari and Kistna in connexion with an enquiry regarding price and export of paddy and rice in the northern deltas. The result of the enquiry showed that the cultivators were getting as good prices as possible for paddy, that the transport and milling charges and middleman's profits were not excessive and that facilities were not wanting for the export of the produce. This was ordered to be published by the Government in the form of a press communiqué.

The question of maintaining and extending the market for Tanjore rice in Ceylon is engaging attention.

Government appointed a committee including the Director of Agriculture for the co-ordination of prices and other statistics. The report is under the consideration of the Government.

#### IX.—EXPENDITURE.

55. The receipts and expenditure for the year 1931-32 and the corresponding figures for the previous year 1930-31 are as follows:—

	1930-31.	1931-32.
	RS.	RS.
Expenditure .. ..	20,29,559	17,73,165
Receipts .. .. .	2,28,196	2,09,536
Net expenditure .. ..	18,01,363	15,63,629

The decrease in expenditure in 1931-32 as compared with that of 1930-31 is due to the following reasons:—

- (a) The non-filling up of leave vacancies.
- (b) The emergency cut in salaries and allowances (compensatory).
- (c) The reduction in the rates of travelling allowances of officers.
- (d) The general cut ordered in contingent expenditure especially the curtailment of expenditure on building works.

As regards the decrease under receipts, it is mainly due to the general trade depression prevailing throughout the Presidency.

X.—PROGRAMME OF WORK FOR 1933.

56. The main lines of work are indicated below.

(i) *Research.*

A.—Research Sections.

(1) *Botany.*—Survey and study of weeds, fodder grasses, bananas and plantains of the Presidency. Floristic surveys in Coimbatore, Malabar and South Kanara districts. Revision of nomenclature of sheets in collections.

(2) *Chemistry.*—In addition to the analytical and advisory work, the following problems will receive special attention :—

*Soil Science.*—Systematic examination of soils and soil profiles to obtain precise knowledge of the behaviour of soils to fertilizer treatment and crop yields ; field studies of the movement and utilization of soil moisture ; study of the effect of deep and shallow ploughing on the physical, chemical and bacteriological properties of the soil ; examination of the methods of estimating the pH values of soils.

*Manures and plant nutrition.*—Study of the agencies responsible for the loss in the soil of added nitrogen in the form of fertilizers ; study of the proper ratios in which nitrogen, phosphate and potash are required by different soils and different crops ; utilization of night-soil by Activated Sludge process and pouдетte.

*Animal nutrition.*—Determination of digestibility of different roughages and concentrates ; manuring in relation to the nutritive value of crop.

*Bacteriological.*—Investigation into the possibilities of extracting oil from oil-seeds by bacterial and enzymic processes.

*General.*—Analysis of insecticides and fungicides ; investigation into the causes that affect the colour and keeping quality of jaggery, curing of ginger.

(3) *Crops*—(a) *Millets.*—Continuance of study of mode of inheritance of characters in millets and varietal survey of the sorghums ; study of variation in lab-lab and horsegram and single-plant selections of *sorghum*, *setaria* and *corucana* ; experiments on dry farming in relation to millets.

(b) *Paddy.*—Maintenance of purity of strains already released ; trails of progenies of promising hybrids ; breeding for disease resistance ; study of inherent qualitative and quantitative characters ; chromosome study of the cultivated and wild rices and their bearing on the occurrence of spikelet sterility ; histological studies of the nutritive value of grains ; cultural, varietal and manual experiments.

(c) *Cotton*.—Study of the inheritance of seed and lint weights and of resistance in Cambodia; study of the physiology of resistance, yield and rotation experiments, isolation of drought resistant strains able to different tracts.

(d) *Oil-seeds*.—Cultural and varietal trials of groundnut; varietal trials and self-fertilization of heavy yielders; study of groundnut pollen; varietal trials of castor for seed and for leaf for eri silk culture; varietal trials of gingelly; study of seedlings of cashewnuts to select desirable types; crossing of soya beans with local beans and pulses.

(e) *Fruits*.—Budding of imported varieties of apples on stalks of the indigenous varieties; budding of varieties of plums on peaches; examination of the vitamin contents of mangoes; experiments on dried plantains; experiments on the storage of mangoes and plantains; crossing of different vegetables.

(f) *Sugarcane*.—Experiments to determine all the possible seasons in the year when sugarcane can be grown; trials of medium canes and sorghum-sugarcane hybrids; cultural experiments.

(4) *Entomology*.—Continuance of apicultural work; stationing assistants in different circles to study specific problems; economic work such as testing different kinds of insecticides against various kinds of pests including pests of stored products.

(5) *Implements*.—Trials of reversible disc ploughs, cultivators, bund forming implements and subsoil ploughs, tests of water-lifts, seed drill and seed sower for attachment to country drill.

(6) *Livestock—Crossbreds*.—Study of the effects of mating half-breds on half-breds and breeding back of the crossbreds with Scindhe bulls.

*Scindhe herd*.—Building a herd of good milkers and breeding bulls.

*Ongole and Kangayam*.—Building a herd of animals of good draught type and fair milking capacity by selection.

*Buffalo*.—Grading up the half and three-fourth bred by the use of pure Delhi bulls.

*Sheep*.—Building a stock of a white breed, paying attention to improvement of yield in wool and mutton.

*Poultry*.—Establishment of flocks of imported herds for distribution.

Feeding trials of foodstuffs.

(7) *Mycology*.—Investigation of foot-rot of paddy, blast of paddy, false smut of paddy, pollu of pepper, wilt in betel vine, diseases of red and Bengal-gram, mosaic of sugarcane, shoot-rot of coconut, die-back of cashewnut, diseases of citrus, clump and wilt diseases of groundnut.

## B.—Agricultural Research Sta.

(1) *Anakapalle*.—Trials of strains of ragi and paddy. Investigation of methods of cultivation, manurial, and water requirements of sugarcane; trial of citrus varieties imported from Australia. Investigation into the damage caused by the sugarcane borer and methods of control. Trial of circular water-lift, plough and sugarcane mills.

(2) *Samalkot*.—Trial of growing sugarcane with restricted water-supply. Investigation on the effect of water on period of flowering, maturity and yield of plantains. Experiments with garden land crops grown in rotation with paddy. Isolation and test of strains of paddy.

(3) *Guntur*.—Selection of high-yielding strains of cotton; study of characters of chilli plant; selection work in chillies, manurial and insecticidal experiments on chillies; selection work in maize.

(4) *Nandyal and Hagari*.—Evolution of high-yielding and drought-resistant strains of cotton and sorghum; trial of Cambodia as a dry crop; selection of single plants of onions, *setaria*, groundnut, Bengal-gram and chillies. Experiments of grading of sorghum seed; experiments with poudrette; experiments on retention of soil moisture and deep ploughing.

(5) *Palur*.—Testing of varieties of sugarcane. Investigation of methods of manuring and of the effect of varying rotation in sugarcane. Testing of strains of paddy; investigation of methods of manuring of paddy. Study of semi-dry paddies.

(6) *Aduturai*.—Testing of strains of paddy. Investigation of methods of manuring paddy; trial of garden crops and sugarcane in rotation with paddy.

(7) *Kovilpatti*.—Testing of strains of cotton; investigation into the harmful effects of fodder cholam preceding cotton. Suitable rotation with cotton. Trial of cumbu strains.

(8) *Taliparamba*.—Varietal and manurial trials of pepper; investigation on the effect of mosaic on the yield of cane; study of 'pollu' disease.

(9) *Nanjanad*.—Varietal, manurial and cultural trial of potatoes; trial of different grain and green manure crops; investigation on the keeping quality of seed potatoes.

## C.—Trial Plots.

*First Circle*.—J. 247 and Co. 213 varieties of sugarcane with a restricted supply of water, types of ragi and paddy isolated at Anakapalle and Samalkot.

*Second Circle*.—Trial plots of paddy and sugarcane.

*Third Circle*.—Trial of sugarcane varieties, sorghum, long duration of paddy varieties and Egyptian cotton.

*Fourth Circle.*—Trial of improved varieties of paddy, sugarcane and groundnut.

*Fifth Circle.*—Trial of improved varieties of paddy, *pennisetum*, Pusa variety of tobacco, Cambodia and *Karunganni* cottons, onions, *sorghum* and groundnut.

*Sixth Circle.*—Trial of paddy, cotton and ragi.

*Eighth Circle.*—Trial of ragi, paddy, potatoes, sugarcane, Pusa tobacco, *sorghum* and groundnut.

(ii) *Demonstration.*

(1) *Crops.*—Strains of paddy, ragi, *sorghum* and cotton. Varieties of sugarcane; short planting and line planting of sugarcane; low seed-rate for paddy nurseries and clean cultivation.

(2) *Implements.*—Introduction of standard types of ploughs, H.M. guntakas, drilling implements. Improved sugarcane pans.

(3) *Manures.*—Proper methods of preserving cattle manure and manufacture of composts. Introduction of green manure crop for increasing organic matter in both garden and wet lands. Oil-cakes for sugarcane.

(4) *Seed-supply.*—Increase of seed in different varieties, especially paddy, cotton and green manures.

(5) *Cattle.*—Stationing of stud bulls; advice on proper care of cattle; demonstration of ensilage, fodder crops.

(6) *Jaggery manufacture.*—Clean preparation; construction of Sindewahi furnaces.

(7) *Insect pests and diseases.*—Advice on proper methods of combating with plant pests and diseases: sprayers, insecticides, etc.

(8) Demonstration plots in all centre villages in the holdings of ryots under departmental supervision.

(9) *Exhibitions* at all important fairs and festivals: motor exhibition vans, lantern lectures.

(10) *Associations.*—Formation of agricultural or co-operative associations to take up stocking and sale of implements, seeds, etc.

(11) Economic survey of villages.

(iii) *Agricultural Education.*

Continuation of the Degree course at the college and opening of short courses. Continuation of farm labourers' schools.

(iv) *Agricultural Economics.*

Improvement in the marketing of plantains, mangoes, groundnut and rice mainly through co-operative societies; study of the cost of production of sugarcane, cotton and rotation crops; co-operation with the Industries Department in the spread of the manufacture of sugar with the help of centrifugals; survey of fruit production.

(v) *Extension of Agricultural Improvements.*

Provision of pure paddy seed on a large scale ; provision of pure cotton seed of Co. 2 (Cambodia) and H. 1 (Hagari) on a large scale ; extension of the sugarcane area in the Presidency ; introduction of Cambodia cotton in the Godavari and Kistna deltas and of Karunganni in Trichinopoly ; utilization of waste land, spread of agricultural improvements on a mass scale with the help of takavi loans.

I have the honour to be,

Sir,

Your most obedient servant,

S. V. RAMAMURTY,

*Director of Agriculture.*

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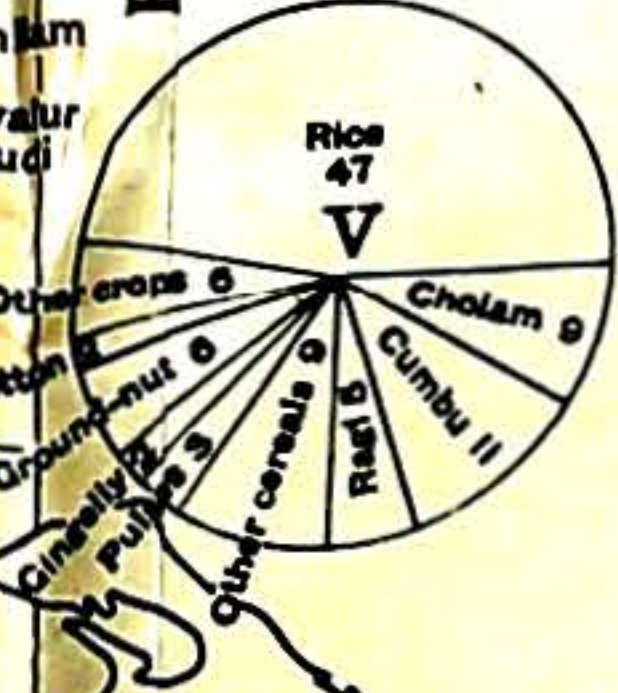
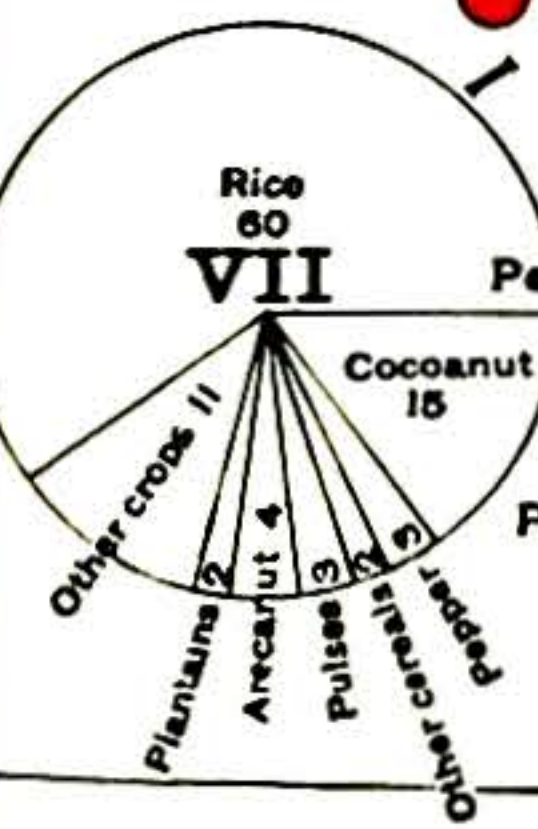
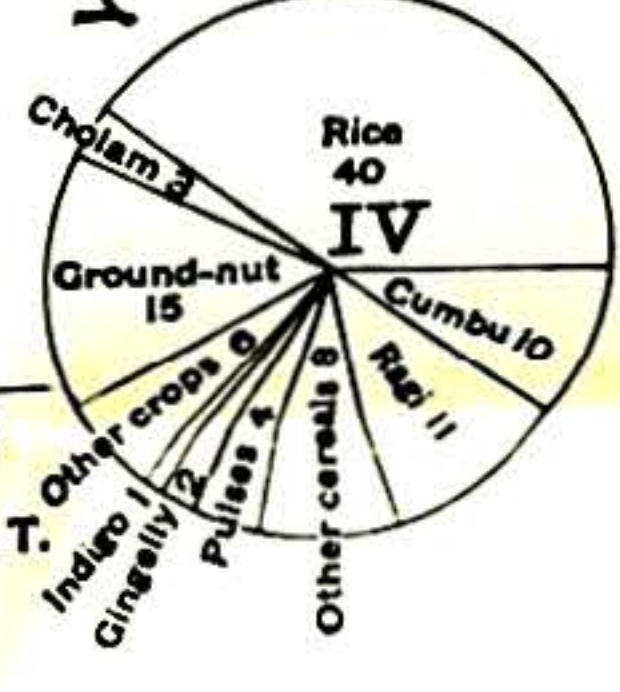
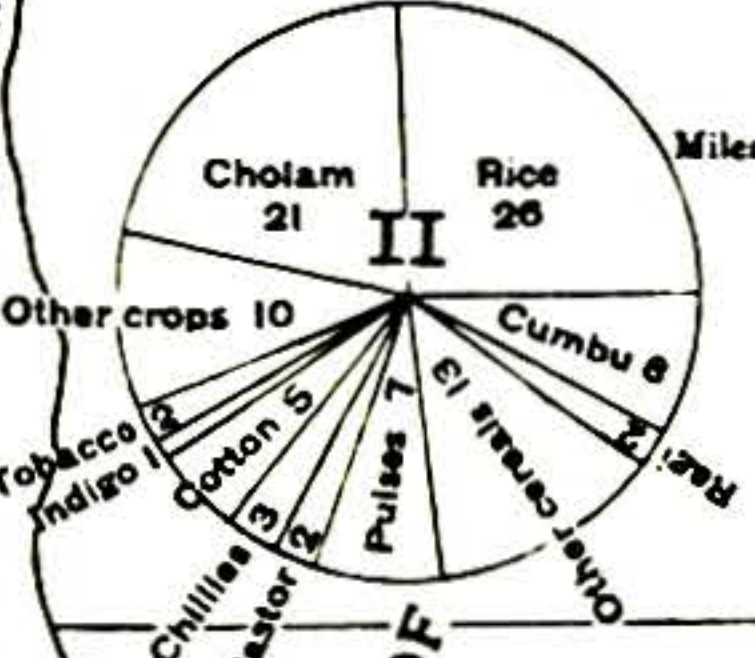
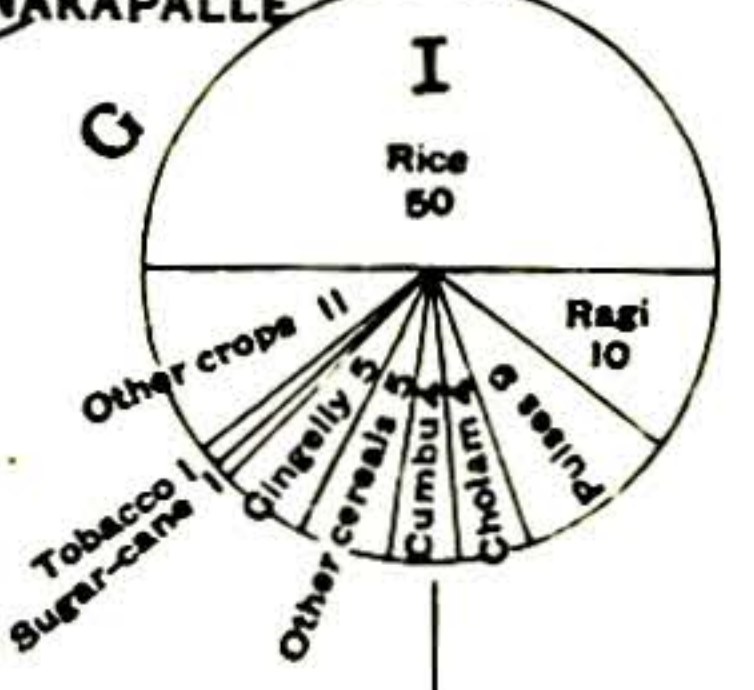
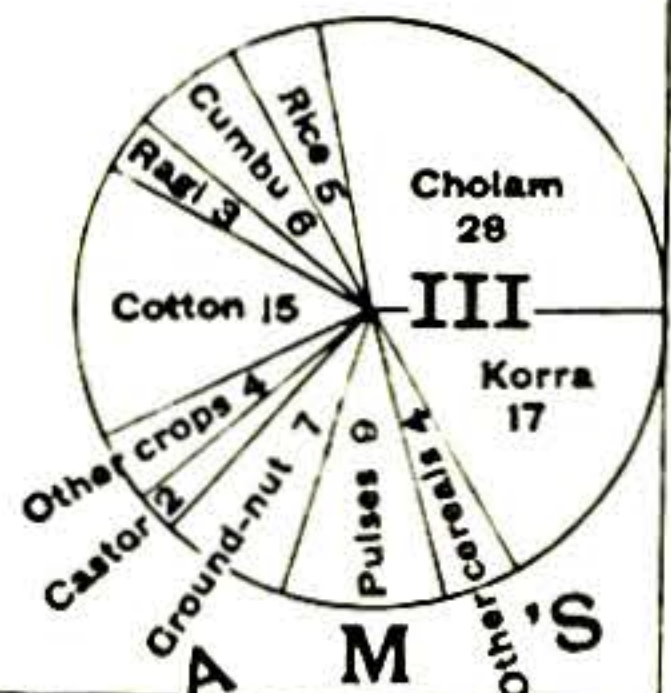
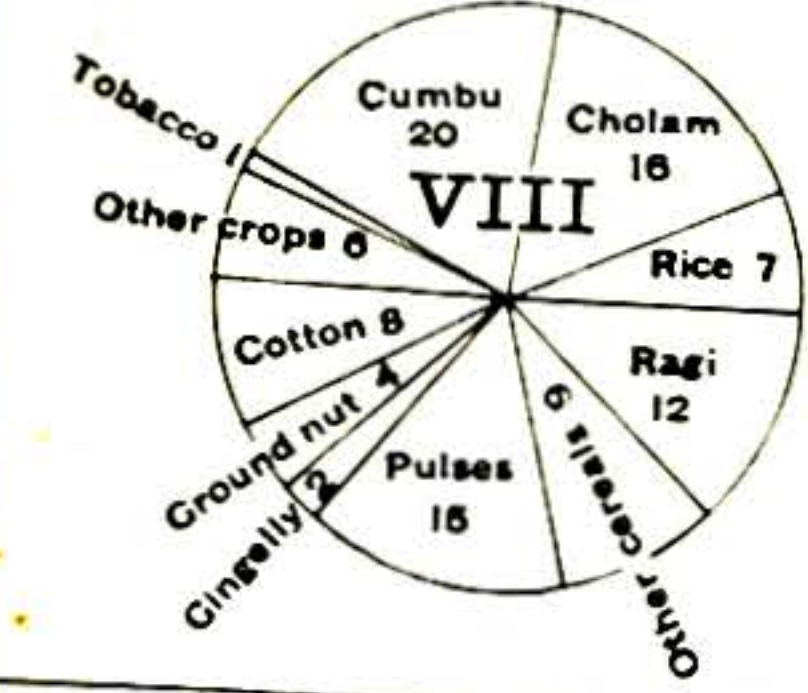
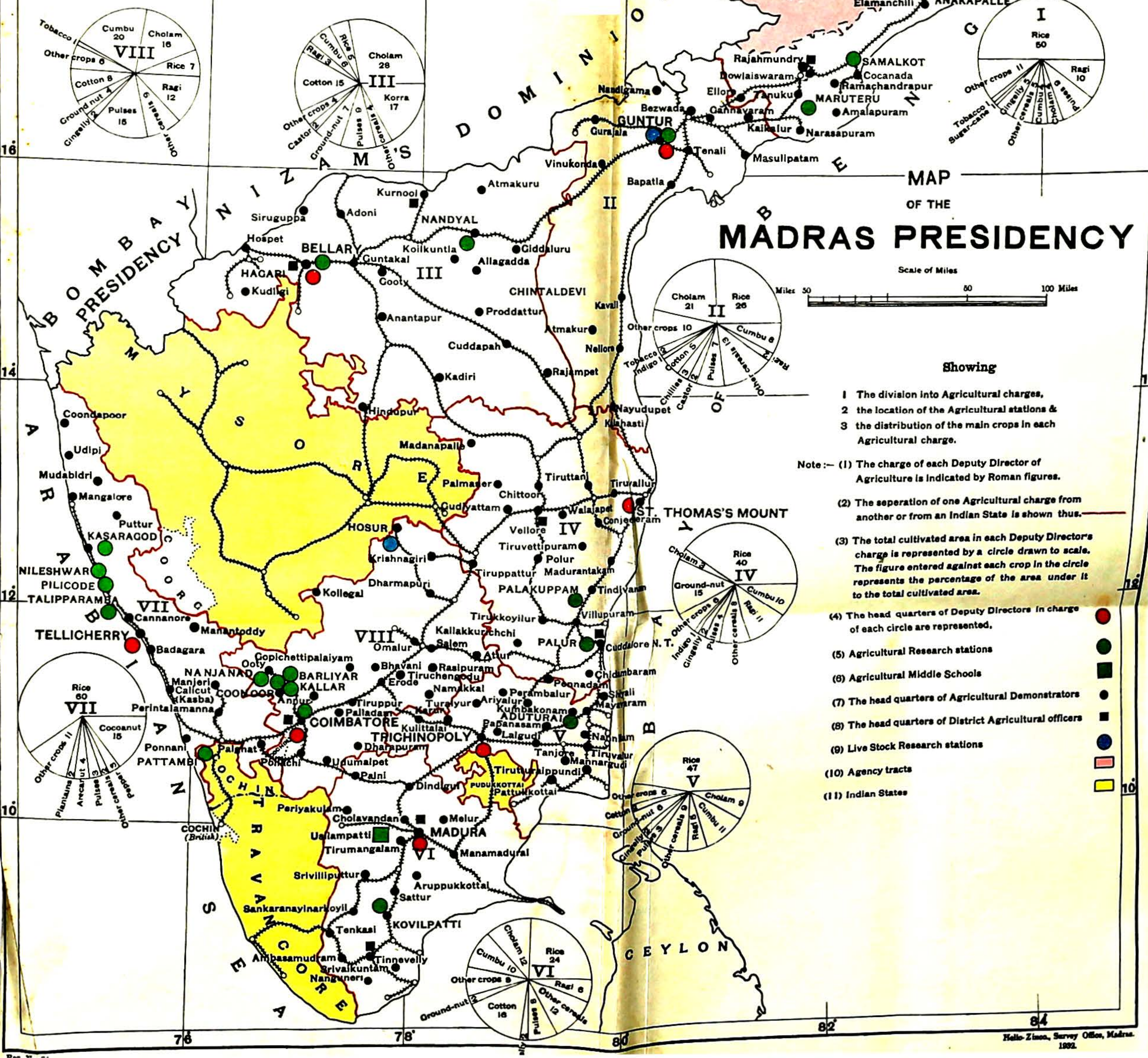
## GLOSSARY.

Barley .. .. .	<i>Hordeum vulgare.</i>
Betel-vine .. .. .	<i>Piper betle.</i>
Castor .. .. .	<i>Ricinus communis.</i>
Cashew-nut .. .. .	<i>Anacardium occidentale.</i>
Cholam .. .. .	<i>Sorghum vulgare.</i>
Cotton .. .. .	<i>Gossypium.</i>
(i) Cambodia cotton .. .. .	<i>Gossypium hirsutum.</i>
(ii) Karunganni cotton .. .. .	<i>Gossypium indicum.</i>
(iii) Uppam cotton .. .. .	<i>Gossypium herbaceum.</i>
(iv) Pulichai cotton .. .. .	<i>Gossypium neglectum.</i>
(v) Westerns cotton .. .. .	} Mixture of <i>Gossypium herbaceum</i> and <i>indicum.</i>
(vi) Northern cotton .. .. .	
Chillies .. .. .	<i>Capiscum sp.</i>
Coconut .. .. .	<i>Cocos-nucifera.</i>
Cumbu .. .. .	<i>Pennisetum typhoideum.</i>
Gingelly .. .. .	<i>Sesamum indicum.</i>
Groundnut .. .. .	<i>Arachis hypogoea.</i>
Grape vine .. .. .	<i>Citrus decumana.</i>
Horsegram .. .. .	<i>Dolichos biflorus.</i>
Khaki weed .. .. .	<i>Alternanthera echinata.</i>
Kolukattai grass .. .. .	<i>Pennisetum cenchroides.</i>
Korai .. .. .	<i>Cyperus rotundus.</i>
Korra .. .. .	<i>Setaria italica.</i>
Mangoes .. .. .	<i>Mangifera indica.</i>
Mango steen .. .. .	<i>Garcinia mangostana.</i>
Maize .. .. .	<i>Zea mays.</i>
Onion .. .. .	<i>Allium sativum.</i>
Orange .. .. .	<i>Citrus aurantium.</i>
Paddy .. .. .	<i>Oryza sativa.</i>
Pani varagu .. .. .	<i>Panicum miliaceum.</i>
Pepper .. .. .	<i>Piper nigrum.</i>
Peach .. .. .	<i>Persica vulgaris.</i>
Pillipesara .. .. .	<i>Phaseolus trilobus Ait.</i>
Plantains .. .. .	<i>Musa sapientum.</i>
Plum .. .. .	<i>Prunus salicina.</i>
Potato .. .. .	<i>Solanum tuberosum.</i>
Ragi .. .. .	<i>Eleusine coracana.</i>
Redgram .. .. .	<i>Cajanus indicus.</i>
Samai .. .. .	<i>Panicum miliare.</i>
Sugarcane .. .. .	<i>Saccharum officinarum.</i>
Tobacco .. .. .	<i>Nicotiana tobacum.</i>
Turmeric .. .. .	<i>Curcuma longa.</i>
Varagu .. .. .	<i>Paspalam scrobiculatum.</i>
Wheat .. .. .	<i>Triticum spp.</i>



# 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 Tinnevelly
- VII Malabar and South Kanara
- VIII Salem, Coimbatore and the Nilgiris





## CONTENTS

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	PAGE
I Administration .. .. .	1
II Agricultural Education .. .. .	2
III Season .. .. .	5
IV Research .. .. .	7
V Demonstration .. .. .	25
VI Legislation .. .. .	34
VII Publications .. .. .	37
VIII Statistics .. .. .	38
IX Expenditure .. .. .	39
X Programme of Work for 1933-34 .. .. .	39
Glossary .. .. .	46

R.O.C. No. D. 68-Pdl.'32.

OFFICE OF THE DIRECTOR OF AGRICULTURE

*Madras, dated the 10th August 1933.*

From

S. V. RAMAMURTI, Esq., I.C.S.,  
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 1932-33.

I.—ADMINISTRATION.

2. I continued to be in charge of the Department throughout the year.

3. *Indian Agricultural Service.*—M.R.Ry. Rao Bahadur D. Ananda Rao and Mr. R. C. Broadfoot were promoted to the selection grade with effect from 9th September 1931 and 7th October 1932, respectively. The lien of Mr. Saadat-ul-lah Khan whose services had been lent to Government of India was suspended with effect from 15th August 1932. Messrs. R. C. Broadfoot and A. C. Edmonds who were on leave out of India at the beginning of the year returned to duty and were posted to the VI and III circles respectively.

4. *Madras Agricultural Service.*—M.R.Ry. Rao Sahib T. V. Rajagopalacharya, Vice-Principal, Agricultural College, Coimbatore, retired from service from 15th June 1932. I regret to record the sudden and untimely demise of M. Kunhambu Nambiyar, Assistant Director of Agriculture, Madura, on 6th December 1932 from smallpox.

The loan of services of Rao Sahib Y. Ramachandra Rao to the Government of India for appointment as Locust Entomologist was extended for one year up to the end of 31st March 1934.

5. *Madras Agricultural Subordinate Service*.—There were no additions to this service during the year. Consequent on the taking up of certain schemes financed by the Indian Central Cotton Committee and the Imperial Council of Agricultural Research during the year, officers already in service were temporarily lent to those bodies and vacancies caused thereby were filled by fresh recruits.

6. *Retrenchment*.—In addition to the 15 posts already retrenched, to which reference was made last year, the following posts were retrenched :—

(i) *Madras Agricultural Service*—

- (1) Two posts of Assistant Directors of Agriculture.
- (2) Personal Assistant to the Director of Agriculture.
- (3) Statistical Assistant to the Director of Agriculture.
- (4) Personal Assistant to the Principal (temporary).
- (5) Superintendent, Livestock Research Station, Chintaldevi.

(ii) *Madras Agricultural Subordinate Service*—

- |   |  |
|---|--|
| (1) One Upper Subordinate of Livestock Section. |  |
| (2) Two clerks                                  | } Assistant Director of Agriculture's staff. |
| (3) Four peons                                  |  |
| (4) One non-Technical Teacher                   | } Middle School, Taliparamba.                |
| (5) One peon                                    |  |

The full effect of retrenchment has resulted in the loss to the Department of eight gazetted officers, 24 Upper and Lower Subordinates, eight clerks, etc., and 17 menials, which is a big toll on a young department such as this.

## II.—AGRICULTURAL EDUCATION.

7. The Middle School at Taliparamba was abolished at the end of April 1932 at the termination of the school session and the staff attached was retrenched. The activities of the Department in regard to Agricultural Education otherwise continued as before.

8. *Agricultural College, Coimbatore*.—The number of applicants to the College dropped from 321 to 180. Of this, only 125 appeared before the Selection Committee of whom 48 were selected. The same members of the Selection Committee as last year continued this year. The strength of Class I at the end of the year stood at 45, including an Agency scholarship holder.

The syllabus and revised University Regulations for the B.Sc., Ag., degree course were brought into force with effect from July 1932.

The tuition and lodging fees for the students recently introduced by Government were levied on the students with effect from July 1932.

*Examinations.*—Forty-eight appeared for B.Sc., Ag., Part I, and 40 came out successful, two failed completely and six in one subject.

For B.Sc., Ag., Part II, 59 were sent up and 54 qualified themselves for the degree.

*Scholarships and Prizes.*—As a measure of retrenchment the amount of scholarship was reduced to Rs. 20 from Rs. 25 and the award of scholarship was confined from the beginning of the academic year only to two students of the Moslem community and three of the depressed classes, including backward communities. During the year two scholarships were held by the Moslem and backward classes and the special agency scholarship was awarded to a student of the locality. Prizes and medals were presented to successful candidates in the University examination on 18th March 1933 under the presidentship of Sir T. Vijayaraghava Acharya, K.B.E., Vice-President of the Imperial Council of Agricultural Research.

*Tours.*—In addition to the weekly day excursions, the third-year students had one long tour in the Tamil districts. This class also toured in the Nilgiris for the study of fruit cultivation. Class II went on a tour to III Circle, Bangalore and Hosur.

*Library.*—With the special grant of Rs. 1,500 sanctioned by Government during the year, 166 books were purchased and added to the Students' Library in the Freeman Building. About 2,521 books and periodicals were received, irrespective of the number of periodicals received in exchange.

*Dairy.*—At the beginning of the year, there were on an average 33.6 cows in the herd of which 24.4 were in milk as against 32.4 and 27.4, respectively, in the previous year. The decrease in the percentage of milch cows this year was due to the transfer of 12 milking cows from Hosur as against the transfer of 26 milch cows in 1931-32 and increase in the case of dry cows due to transfer of 10 dry cows to Hosur as against 23 dry cows in 1931-32 and also to some of the cows proving unthrifty and drying off long before the usual time.

The total milk yield recorded during the year—excluding blood-stained milk and colostrum which is not saleable—was 140,114 lb. as against 158,933 lb. in 1931-32. This decrease is due to fewer cows milking this year. The daily average yield of milk per cow was 15.65 lb. as against 15.9 lb. in the previous year. The fall is attributable to the prevalence of foot and mouth disease for 2½ months in the year, and the presence of cows in advanced lactation.

Out of the total yield of 140,114 lb. milk during the year, only 123,876 lb. were available for sale after feeding the calves (weaned) with 15,047 lb., viz., 50,410 lb. to the estate residents and 28,666½ lb. to the college hostel. The demand from the estate was steady,

but that from the hostel and for instructional purposes was not. Cows are maintained for all the 12 months in the year, while the students' hostel and instruction need milk only for eight months when the College is in session and this upsets any arrangement for securing economy. The milk available during this period of four months cannot be disposed of readily as milk or as butter, since no corresponding supply can be assured to customers for the rest of the year.

The balance of whole milk, viz. 44,968 lb., left over after the sales noted above, was separated and it yielded 4,433.2 lb. of cream, which together with 263 lb. of cream purchased from outside amounted to 4,696 lb. Of this, 53.6 lb. of cream was sold and the rest converted into 2,515.6 lb. butter. This quantity was disposed of as below :—

	LB.
(a) Sold as butter .. .. .	1,480.1
(b) Used for buttering the teats while milking .. .. .	45.3
(c) Used for demonstrating to students the manufacture of ghee .. .. .	43.0
(d) Converted into ghee for want of sales of butter .. .. .	947.6
	<hr/>
Total ..	2,516.0
	<hr/>

The last item accrued when the College was not in session.

The cost of production of milk per lb. works out roughly to 6 pies while the rate at which it is sold is 18 pies per lb. which is thrice the price of production. It may therefore be argued that apart from the overhead charges there is no loss from production of milk. Loss arises only from the conversion of definite quantities of milk, i.e., 60 lb. a day into butter for instructional purposes and from there being little or no sale for milk or butter for 4 months when the College is not in session.

The receipts during the year amounted to Rs. 12,600 as against the expenditure of Rs. 21,774, thus resulting in a net loss of Rs. 9,174 excluding about Rs. 21 worth of stock in hand at the end of the year.

The question of the strength of the herd is under the consideration of the Government.

9. *Conference*.—Owing to financial stringency, the College Day and Conference were postponed to the next year.

10. *Agricultural Middle Schools*.—The middle school at Tali-paramba was abolished in April 1932 and the school at Kalahasti could not be opened during the year.

The Agricultural middle school at Usilampatti, maintained by the Madura District Board, had a marked increase in the number of students under training. There were 38 students out of whom 20 were Kallars and 18 of non-Kallar castes.

11. *Farm Labourers' Schools.*—The three schools at Anakapalle, Coimbatore and Palur were continued during the year under report. At Anakapalle there were 32 boys for study as against 39 in the previous year in the day school and 20 adult labourers regularly attended the night school. At Palur the school for labourers' children and the night school for adults worked satisfactorily. At Coimbatore there were 10 boys in the day school and 10 adults in the night school, and the strength rose to 28 pupils—excluding nine farm boys at the end of the year.

The vocational school at Muthanendal maintained by the Ramnad District Board introduced agriculture in its curriculum and an Agricultural Diplomat was added to the staff.

12. *Practical Training in Agriculture.*—At Anakapalle there were at the beginning of the year eight boys under training, out of whom two have been entertained as demonstration coolies, one entered the Agricultural College and the rest went back to the land. There were at the end of the year seven literate boys for this course of study. At Samalkota, three men received training while one maistri from Guntur was given special training in jaggery-making.

*Post-graduate Research.*—A new feature of the educational activities of the Department is the encouragement of research by the members of the staff for post graduate degrees, under the guidance and supervision of Experts. In Chemistry, M.R.Ry. C. Narasimhachari, Assistant Lecturer in Chemistry, was awarded the M.Sc. Degree of the Madras University for his thesis on the “Diastasic Enzymes of Cholam Malt.” M.R.Ry. P. Satyanarayana, Assistant in Chemistry, has also been awarded the M.Sc. degree for his thesis on “The Chemistry of Bordeaux Mixture.”

The Madras University has declared B.Sc. Ag.'s of the College to be eligible for M.Sc. Degree. Three have joined the Chemist's section as the first set of post-graduate students.

A Research scholar of the Madras University is engaged at the Coconut stations at Kasaragod on the morphological characters which affect the yield of coconuts.

### III.—SEASON.

13. A depression formed off the Malabar Coast during the third week in May ushered a temporary advance of the monsoon resulting in heavy rainfall. After the 26th of May, the monsoon current began to retreat and in so doing very rough seas and gales were experienced along the west coast accompanied by heavy rain doing



considerable damage to railway and telegraph lines and to property in general in that area. The monsoon was weak in June, while it somewhat strengthened in July and August and the September rains were on the whole adequate though below normal. The total rainfall of the south-west monsoon was less than the average in all the districts except Bellary, Coimbatore, Trichinopoly, Madura, Ramnad and Tinnevely.

A depression in the south-west of the Bay between the 9th and 12th October caused fairly widespread rain. Another depression formed off the Coromandel coast on the 30th October caused widespread rain in south and north Madras in the first week of November. On the 22nd of November, a depression in the south of the Bay intensified into a storm and was responsible for general and local heavy rain on the Coromandel coast and in south Madras. Rainfall also extended into the north Madras coast and south Deccan. These heavy rains caused breaches in irrigation sources in parts of Tanjore district. In December the rainfall was below average except in parts of the central and southern districts. The north-east monsoon on the whole was above average except in Kurnool, Cuddapah, Nellore and Chittoor.

The effect of the season on the crops at the various agricultural stations is described below.

The south-west monsoon adversely affected the yield of paddy at the Agricultural Research station, Berhampur. Owing to the drought that prevailed during the latter part of the year, sugarcane and sunnhemp at the Anakapalle station had to be irrigated by lift irrigation. At Samalkota, sugarcane, plantain, garden and dry crops were benefited by the south-west monsoon and crops yielded above the average. Owing to the bad distribution of the rainfall, paddy at the Agricultural Research Station, Maruteru, yielded much less than normal. In Guntur, adverse season during the north-east monsoon affected crops in the later stages. At the Agricultural Research station, Hagari, seasonal conditions were favourable for cotton but owing to too much moisture in early stages the crop was subjected to fungus and insect attacks; while at Nandyal the season was unfavourable to groundnut, chillies, fodder and green manure crops.

At the Agricultural Research station, Palur, dry crops suffered from drought during the south-west monsoon period while heavy rains during the north-east monsoon lodged the sugarcane thrice; at Palakuppam, a similar season was experienced where castor was lodged during the north-east rains. The season was, however, favourable for paddy at the Agricultural Research station, Aduurai. At Kovilpatti, the season was favourable for cotton, fodder, cholam and pulses generally, while at Taliparamba it was favourable for dry crops, coconut, sugarcane, fair to paddy and prejudicial to pepper. At Coimbatore, though the rainfall on the whole was

evenly distributed, it was unfavourable to cholam and certain types of cotton. At Nanjanad, the heavy rains in October retarded the growth of the second crop of potatoes.

#### IV.—RESEARCH.

14. As has been expressed in previous reports research is the basis of all agricultural improvement. Without it there can be no real improvement in Agriculture. Much attention was, therefore, paid this year to research as may be seen from the following paragraphs.

##### A.—Botany.

15. Owing to the abolition of the post of the Systematic Botanist, the work of the section was necessarily cut down, the only assistant in charge doing as much as was possible in the circumstances. Over nine hundred botanical specimens were identified for the Herbarium and for various correspondents—officers of the Forest Department and of the local Agricultural Department and the Superintendent, Pasteur Institute, Coonoor; 2,090 sheets were incorporated into the Herbarium. Two thousand and eighty specimens were poisoned and 2,070 specimens were mounted. Under the item of loan and exchange of specimen plants, 19 sheets of arisæma (*aroideæ*) lent to Kew were received back. At the instance of the Professor of Botany, Maharaja's College of Science, Trivandrum, 70 representative duplicate grasses of South India were presented to the Herbarium at the Smithsonian Institute, Washington, United States of America. Three hundred and fifty four specimens of African grasses, Singapore and North Indian plants were received from the Forest Botanists of Dehra Dun and Union of South Africa, Pretoria and 136 duplicates of South Indian species were sent to them in exchange.

Under economic work may be mentioned the study of indigenous fodder grasses suited to South Indian pastures which were planted for the purpose both in the Botanic Garden and in the Central Farm. Some interesting results have been obtained. Another interesting experiment that is being conducted by this section is in connexion with the eradication of Khaki weed (*alternanthera echinata*) and nut grass (*cyperus rotundus*). Sodium arsenate (of  $4\frac{1}{2}$  per cent strength) at 300 lb. per acre was found to kill the Khaki weed in three days. Two or three ploughings at intervals with a mould-board plough were effective in exterminating it on arable land. But these methods are not effective in destroying the vitality of the seed buried in the soil. Methods to eradicate nut grass are in progress. The study and survey of bananas and plantains were continued this year also.

##### B.—Chemistry.

16. The Chemistry section is the largest at the Research Institute and is equipped with five gazetted assistants besides a large

number of subordinate staff. The work of this section may be divided into two main categories, (1) advisory and (2) research.

As regards item (1), 837 samples consisting of soils, manures, fertilizers, feeding stuffs, fodders, plants, grains, straws, sugarcane, oil seeds, insecticides and fungicides were analysed. The realization of Rs. 883 as fees for analyses as against Rs. 250 last year shows the popularity of this section. Besides helping the officers of this department, other departments such as the Industries, Jail, Fisheries and Public Health were also assisted.

(2) *Soil Characteristics*.—A systematic study of soils for their characteristics was in progress during the year. The object of such a study is to obtain precise information from the behaviour of soils towards varying cultural and manurial practices and to enable the chemist to advise the agriculturist on problems of soil fertility. From the available data on the analysis of clays it would appear that black soils are characterized by a high content of total silica (50-54 per cent) and lime and magnesia (5-7 per cent), and low iron and alumina (28 per cent). The red soils are relatively poor in silica (45 per cent), very poor in lime and magnesia (0.6 per cent) and richer in iron and alumina (41 per cent).

Besides this, work on base exchange, conductivity of soil extracts, soil reaction and buffer values of aqueous soil extracts and soil moisture experiments are in progress.

The study on soil nitrogen requires special mention. From a practical point of view, the results so far obtained indicate that an adequate supply of organic matter in the soil is a very important factor in maintaining the nitrogen status of the soil and in controlling loss of nitrogen. This affords independent evidence that the first requirement is organic matter for our soils.

With the recognition of the fundamental importance of organic manures to Indian Agriculture, special attention was paid to waste organic vegetation and farm refuse and to composting them as manure for crops. The litter of the eri silk worm which is a by-product in silk worm industry has thus received attention. On the basis of Nitrogen analysis, it was found to be as good as castor cake and from actual field experiments its original and residual manurial values were found to be even superior to groundnut cake as a manure for ragi. The study of the utilization of nightsoil as manure was continued. Using nightsoil and village rubbish in equal quantities and very small quantities of either copper sulphate or common salt in solution, it was possible to eliminate offensive smell during fermentation and to produce a manure without smell but with a high nitrogen content and manurial value. Experiments on making pouquette was conducted at Anakapalle in conjunction with the Public Health Department.

*The Study on the influence of manuring on the quality of the crop.*—This line of work which is of fundamental importance to agricultural wealth and national vitality was initiated in this Laboratory and is being confirmed elsewhere. The results confirmed the previous findings and showed that grain raised with cattle manure or oil cakes possessed better nutritive value for rats than grain raised with chemical manures or no manure at all. Cumbu grain fed at 2 per cent of the weight of the animal, was found to be incapable of protecting the animals from diseases arising out of vitamin deficiency. In another experiment using Eri silk worms for test, castor leaf from plants raised with cattle manure contributed to the better growth of the worms and to greater cocoon weight than those of the worms fed on castor foliage of plants manured with artificial fertilizers or not manured at all.

#### C.—(1) Crops.

17. (a) *Millets.*—In a Presidency as large as Madras with its varying conditions of soil and climate it is but necessary that the improved strains evolved at Coimbatore should first be thoroughly tested under ryots' conditions in the tract where they are to be introduced on a field scale. Sub-stations are therefore essential but for the sake of economy, arrangements have been made to carry on the tests on the existing farms by assistants specially trained by the Millet Specialist. Last year's trained assistants were sent one to each of the Research stations at Hagari and Nandyal to be under the control of the Deputy Director of Agriculture and this year similar work was started at Guntur and Koilpatti. These four stations being in the midst of important millet growing tracts this arrangement completes the equipment of the circle officers with trained assistants to tackle local economic millet problems in their research stations.

*Economic Work*—(i) *Sorghum.*—At the Millet breeding station, 950 units of this important millet were handled for economic as well as scientific studies. Three series of comparative trials were laid one for the yellow and two for the white varieties. In the yellows, strain A. 5809 was good for a second time and in the whites A.S. 1575 proved superior for a second time. These are being tested in ryots' fields under ryots' conditions. Comparative trials of strains suitable for the summer and of mixture of strains suitable for the main season are in progress. Strain A. 560 continues to be the best *Periya Manjal* strain. Over 850 lb. of this were distributed during the year. Of the four varieties of sorghum compared for fodder value the dull mid-ribbed sweet stalked one was found superior. The sorghum yield trials at Hagari have not given any encouraging results for the second time. Fresh material was gathered from 10 different places and 48 early promising selections were made. At Nandyal three strains gave as high a yield as No. 23/10 and much higher yields than T-6, the present standard. Thirty out of 300 selections tried in row yields gave as good yields

as N. 23/10. Three varieties of African sorghum were under trial at Taliparamba on the west coast. Unfortunately they failed to set grain this year.

At Nandyal in a spacing experiment, spacings of  $10\frac{1}{2}$ ", 16", 20" and 24" between lines were tried with no significant increase in yield. Similarly thinning plants in the rows keeping them 9" and 18" apart gave no difference in the yield of grain. In straw, however, the lower spacings gave a significantly higher yield. A comparative trial of ploughing as compared with harrowing resulted in an increase of 80 lb. of grain per acre in favour of the former. In a spacing trial at Hagari out of five spacings, 27" and 15" spacings gave a higher yield as compared with the normal  $13\frac{1}{2}$ " spacing. Fifteen inches spacing gave a higher yield of fodder while the plants in the 27" spacing produced a distinctly bolder grain.

At Nandyal the application of artificials to sorghum gave an increased yield of 300 lb. of grain and 500 lb. of straw. On cotton which followed it, the manure had a residual effect which gave a 50 lb. increase per acre while in the following crop of sorghum an increase of 140 lb. of grain and 400 lb. of straw was noticed.

(ii) *Ragi* (*Eleusine coracana*).—Over 930 units of ragi were under study. Four series of comparative trials were made. E.C. 593 continues to be the best strain. It has passed the stage of trial on the farm and is being tested in the districts. Reports have been received commenting on its superiority from Chittoor, Mannargudi, Koilpatti, Salem and Coimbatore. An increase of 15 per cent in yield may easily be claimed in favour of this strain. E.C. 47, another strain, though longer in duration is finding favour among the ryots of Coimbatore.

At the Agricultural Research Station, Anakapalle, where selection work on ragi has been going on for some years, four selections are of promise.

(iii) *Korra* (*Setaria italica*).—Strain No. S.I. 523 continued to be easily the best. S.I. II was the next best. From both of these strains it can be claimed that they are more than 25 per cent superior to the local mixture. Arrangements have been made with the Deputy Director of Agriculture, VIII Circle, for the distribution of S.I. 523. At Nandyal about 200 selections were in the rows yield stage while during the year fresh selections were made from the local types.

Preliminary work on other millets *cumbu* (*Pennisetum typhodeum*), *arika* (*Paspalum scrobiculatum*), *panivargu* (*Panicum miliacium*) are in progress at the Millets Station at Coimbatore. At Koilpatti, 201 selections were dealt with in *cumbu*, a large number being from the Punjab. Of these, 29 from the Punjab and 10 from local are of promise.

(b) *Paddy*.—Paddy being the staple food of the majority of the population is by far the most important crop in the Presidency.

It is for this reason, plant breeding work was concentrated on this crop from the very beginning. As work progressed and as men were available sub-stations were opened at Aduturai, Maruteru and Pattambi each in charge of a gazetted assistant. Such sub-stations are started by the Paddy Specialist and kept under his control until they are able to cater to the needs of the districts amidst which they are situated when they are transferred to the Deputy Director of the circle concerned. Mention was made in my report for 1931-32 that a Rice Research station was opened at Berhampur—the funds for maintaining the station being furnished by the Imperial Council of Agricultural Research.

As in the past, both economic and agronomic research progressed at all the breeding stations, as well as at the other agricultural stations where paddy is an important crop. Evolution of strains and selection of seed are important items of work of the Paddy stations.

*Economic Work.*—At Coimbatore, the two *Anaikomban* strains which have been found to give 17 per cent and 12 per cent increased yield for the past five years were tried this year in the Tinnevely district in ryots' land with the result that the better of the two has given a significant increase over the ryots' seed. It has been decided, therefore, to release it for general distribution in the district under the name of Co. 8 during this season. Two more promising strains of the *Samba* varieties—*Sendinayaganu* and *Ayyansamba* and two short duration strains—*Tinnevely kar* and *Gobi kar* are in the trial stage.

At Maruteru over 200 selections from the important Godavari and Kistna varieties were under various stages of trial and 580 progenies of hybrids from local varieties were under observation. Several strains which had been giving distinctly increased yields on the station for a number of years were once again tried in ryots' land in the districts and were found to maintain their superiority in point of yield. It has, therefore, been decided to release eight of these strains to be named M.T.U. 1 to 8 for distribution.

At Aduturai Adt. 10 a strain from *Korangu samba* was released for the first time during the year for distribution to ryots. Two strains Adt. 9 and Adt. 11, the former from "*Poonkar*" and the latter from A.E.B. 65 were in their trial plots during the year. The former gave 30 per cent increase over the unselected bulk. Over 600 fresh selections were made during the year in *kuruvai* and *samba* crops.

At Pattambi, 114 strains were under various stages of yield trials. Of these 14 which have finished their trials on the station giving 10-22 per cent increases over the controls consistently for three years will be tried in the districts under ryots' conditions. Besides these 500 new selections were under observation during the year preliminary to undertaking yield trials.

At Berhampur, bulk selections were made in five of the important local varieties, preliminary to pure line work and as an immediate improvement. Besides this, over 2,000 single plant selections have been made in these various varieties for study. Yield trials with strain G.E.B. 24 has proved that it is as good as *Dyyahunda*, the most important local variety, in yield and better than *Ratnachudi* the next most important variety.

In addition to breeding paddies for disease resistance and collection of varieties from other provinces, inheritance and cytological studies are in progress at Coimbatore.

*Agronomic studies*—(a) *Manurial experiments*.—An experiment conducted at Coimbatore, Maruteru and Pattambi for two seasons to determine the optimum time of applying ammonium sulphate to the paddy crop has shown that it is best applied one month after planting at Maruteru and Pattambi and two months after at Coimbatore. Kossier Phosphate as a fertilizer for paddy did not prove superior to bone-meal. The results of the experiment to test the value of intensively manuring of the seed-bed conducted at three stations have proved the greater importance of manuring the transplanted field rather than the seed-bed.

(b) *Cultural experiments*.—In Coimbatore, with medium and long duration varieties keeping the number of plants per unit area nearly the same, transplanting has given more than 25 per cent increase over broadcasting. In the "age of seedlings" experiment with late varieties at Coimbatore and Berhampur ages from 30 to 60 days from the date of sowing did not show significant differences in yield. Spacing experiments at Berhampur where the soil is inherently poor, close planting of 3"-4" has been found to give the maximum yield. At Samalkota, it was found that winter dry ploughing reduced the yield of paddy by 18.5 per cent and summer dry ploughing by 9.2 per cent. It has been proved that under conditions obtaining there dry ploughing of paddy soils has a deleterious effect on the crop. A similar result was obtained at Aduturai, also a station in the deltaic tract.

As expressed in last year's report with the very low price of paddy, other commercial crops like sugarcane, plantain, cambodia, etc., are being tried in rotation with paddy.

## (2) Fibres. (Cotton.)

18. The main work of the cotton section both in the central station at Coimbatore and in the sub-stations at Guntur, Nandyal, Hagari and Koilpatti 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 rain-fed cottons are dealt with.

### Economic Work.

(a) *Breeding*.—A large F. 2 population of crosses between Co. 2 and South African cottons was raised with the object of

selecting heavy bearing and early types which would reduce the number of irrigations given to the crop and would also permit a longer close period being observed in connexion with the control of stem weevil and pink boll worms. Three thousand five hundred and eleven promising plants were selected from garden and dry land. Out of 164 cultures of Cambodia grown for selecting types suitable for rain-fed conditions, 24 showed superiority. Five varieties of Roseum X Indicum crosses and two of Cambodia cotton were under trial at Anakapalle. Among 113 lines of *Nadams* tested with *Karunganni* only six proved to be as early as the standard. In the yield test made with Cambodia strains, it is gratifying to note that for the first time Co. 2 was beaten by three strains, viz., 920, 1267 and 1742. *Karunganni* 546 was again ahead of C. 7. At Koilpatti it has done well in trial plots in ryots' fields.

In Guntur, 300 single plant selections were made from the Cocanadas and Cambodia cotton besides which a large number were under row yield trial. The results are promising.

At Nandyal two strains Nos. 29 and 15 which gave highest yield last year proved to be only equal to N. 14 during the present season. Eight new selections were under trial but owing to an exceptionally poor rainfall no conclusions could safely be drawn.

At Hagari, the improvement of the local "Hingari" cotton by pure line selection was continued. Seven of the eight pure lines among the new selections gave a higher yield than H. 1, the standard cotton but were poor in ginning percentage. It was learnt that the yellow factor in the flower seems to go with small bolls and earliness. Weight of seed in relation to its position in the lock was under study. There does not seem to be any relation between the seed weight and lint weight.

(b) *Agronomy—Rotation.*—Agronomic studies consisted in finding suitable rotation crops with cotton. Cholam and cumbu are the usual crops. Other crops added to the list are ragi, groundnut and green manure. Sowing cotton in a fallow field was also tried. The results obtained were practically in agreement with those of last year, viz., cotton succeeding cumbu, cholam, ragi, groundnut, fallow and green manure crops gave 490 lb., 505 lb., 555 lb., 650 lb., 662 lb., and 919 lb. per acre respectively. The increase especially in the green manure plot (84 per cent over the cholam plot) was remarkable; but it is rather doubtful if the farmer will grow a green manure crop or leave the land fallow in preference to the growing of summer cholam or cumbu which provides him with grain and his cattle with fodder.

In the manurial experiments at the Cotton Breeding Station with two cwt. of ammonium sulphate and 1 cwt. of super it was found that unlike at Koilpatti, the beneficial effects were not commensurate with the cost of manure in all the three years of their



trial. But the results obtained in the rotation experiments suggest that nitrogen in an organic form will lead to better results. When ammonium sulphate was applied as a top dressing with a view to increase the retention of buds and bolls, no improvement in yield was perceived.

A new irrigation experiment was initiated during the year at Coimbatore with the idea of determining the influence of irrigation on the humidity around the plant and utilizing the knowledge thus gained in controlling the spread of insect pests. Some interesting data were collected but this will be discussed after another year of experiment on the same subject.

The various types of spacing trials confirm the common opinion that a higher seed rate should be used in fertile soils.

*Other Crops.*—Redgram and Bengalgram are other crops that received attention in this section. One of the strains of Bengalgram when grown on the Central farm gave 575 lb. per acre when the farm average was only 315 lb. It was also found to be highly wilt resistant.

*Schemes financed by the Indian Central Cotton Committee.*—(a) *Madras Herbaceum Scheme.*—On the completion of season pickings in the several row tests made last year sixteen lines were found to be superior to C. 7. Nine of these were tried for purity. Only four gave hopes of being heavy bearers. All the progenies of crosses between *Karunganni* and *Uppam* strains proved disappointing. But the lines obtained from X-rayed material and from natural crosses gave very encouraging results.

(b) *Pempheris and Physiological Scheme.*—The investigations made during the year were restricted to the Pempheris problem alone. Some interesting data on the distribution of the insect and on its seasonal and off-seasonal history were collected. The infestation was found to be less in Cambodia grown on rainfed lands. The pest was absent in certain parts of Madura and Ramnad districts. No explanation could be adduced for this interesting phenomenon. In any case climatological differences did not appear to be responsible for this state. For, experiments in closed chambers disclosed that the weevil could withstand all types of humidity from 0 to 100 per cent and that the lethal temperatures were below 0°C. and above 50°C. which are far beyond the normal atmospheric conditions obtained in this Presidency.

Based on the observations made last year on the habits of the insects and on the differences found in the mineral constitution of the attacked and healthy plants a few experiments were conducted to test if any wide fluctuations in the incidence could be artificially induced. It was observed that covering the most susceptible region—the hypocotyl—with earth or spraying repellants or dusting stomach poisons on the stem had not indicated any diminution in the proportion of attacked plants. Stimulating the plants with

the chemical constituents found deficient in introduction of parasites that might attack the grubs was another method tried with no effect. A study of the different varieties of cotton for their susceptibilities in regard to weevil infestation revealed that Kidney and Nigerian cotton alone were found to be completely free. These were crossed with Co. 2 with the hope of evolving a resistant type by hybridisation.

Progenies of plants, found to be free or highly tolerant last year showed that the absence of galls noted on their parents was not entirely due to their inherent resistance. Fresh selections for freedom from galls were again made during the year in Co. 2.

Attempts are being made to replace the short stapled, Verum type of cotton, commonly cultivated in South Kanara and North Malabar as a mixture with dry paddy and Broach cotton.

### (3) Fodders.

19. Reference was made last year to the initiation of a study of South Indian grasses. The indigenous grasses suited to local conditions were planted in small plots for a comparative trial. All grew well under irrigation, the three best being *Andropogon annulatus*, *Pennisetum cenchroides*, and *Iseilama laxum*. Teosinte, a fodder grass, was tried at the Central farm, Coimbatore, Hosur and Aduturai. It came up well at the former two places and yielded at 32,000 lb. green fodder per acre at Coimbatore. At Aduturai, *pillipesara* did well giving 22,600 lb. of green fodder per acre in two cuttings. In order to make it popular among ryots, it was sold to them in small quantities but the demand became so great that it was found judicious to reserve whatever was available for the farm herd. Seed of this crop has been collected and distributed to the district staff in the V circle.

At Taliparamba, two silo pits were filled with cholam, cow-gram and hill-grass, the last of which is found in abundance after the south-west monsoon period. The silage was found good and supplied succulent fodder for cattle during the hot months of March and April. Manurial experiments on grasses were continued at the Livestock Research station, Hosur. An experiment to test the effect of the applications of farm yard manure at 10 and 20 cart-loads per acre every year and in alternate years indicated the advantage of applying it at 10 cart loads.

### (4) Fruit.

20. Increased attention has been given to fruit during the year. Fruit culture is in progress in almost all the agricultural stations of the province. In the Nilgiris, experiments in grafting and budding apples and plums on to stocks of different genera but of the same natural family were attempted. No success has yet been obtained. The budding experiments on oranges and grape fruit were continued. Various kinds of citrus stocks were used, and grafting was done by various methods and at different seasons

of the year to determine if possible the most suitable stock to use and the best season in which to graft. The propagation of apple stocks was undertaken on the lines practised at East Malling with considerable success and a large number of stocks was raised by mounding and layering. At Anakapalle observations on the behaviour of different varieties of citrus were continued.

*Plantain.*—At Samalkota, 17 varieties and sub-varieties were under trial. Seedling plantains were also grown for crossing purposes. A survey and study of the Bananas and plantains of the Presidency was undertaken during the year. Important varieties of plantains grown in Malabar and South Kanara were under trial. Nearly 300 suckers of different varieties were obtained for planting at Coimbatore. Full description of 30 varieties and important morphological characters of 12 varieties were recorded. The study of vegetative and floral characters of the crop is under progress while an analysis of the crop is being done by the Chemist.

*Agronomic Studies.*—Manurial experiments were laid down at Samalkota and Kallar. Inoculation experiments against plantain Wilt (*Fusarium cubense*) were instituted and the life history of the fungus was studied. An interesting aspect of the work on plantains this year has been the conversion of ripe plantain fruit into what is popularly known as “plantain figs.” It has achieved a great success and has created a growing demand. Samples of crystallized plantain figs were also sent to England. There seems to be no demand for the figs there but there might be on the continent.

*Coconut.*—“Tall” and “Dwarf” types of coconuts were crossed with a view to build up a desirable type of coconut palm. Hybridization was attempted within the selected palms. Experiments were laid down to find out the most economical manures and to test different methods of manurial application. Investigation into the methods of selecting promising coconut seedlings from the nursery was initiated.

*Vegetable crosses.*—In order to get new types of vegetables, a large number of crosses among various vegetables like tomato, brinjal, chilly, gourd, pumpkin, cucumber, etc., were made. These experiments will be continued next year.

#### (5) Oil Seeds.

21. In addition to the work on the Agricultural Research stations, Palakuppam, Kasaragod and Nileshwar I to III, preliminary work was carried out on the Central Farm where numerous varieties of groundnut, gingelly and castor were tried out. Cytological investigations were taken up during the year.

- (i) *Groundnut.*—(a) Out of the 25 varieties under comparative trials 10 have yielded significantly better than the local variety. “Saloum” which stood first last year has again topped all the varieties with an increase of 26 per cent

over local mauritius. Arrangements will be made to send this out to districts for trial. About 2,400 new selections were made during the year.

- (b) *Hybridization*.—With a view to evolve high yielding short duration varieties of bunch and spreading groundnut, 1,530 flowers were crossed which yielded 530 pods. Thirty-one F-1's of a cross between Gudiyattam Bunch and Philippine white were studied.
- (c) *Spacing Trials*.—Spacing of 6" × 6" for the bunch variety and 9" × 9" for the spreading proved most economical. The wider-spaced plants produce more of flowers and pods per plant than the closer-spaced ones. There is a slight tendency for the kernels to increase in size with the increased spacing.
- (d) *Pod Formation*.—Out of the total flowering period of about two months the flowers produced in the first month were alone seen to produce mature pods. Generally the later formed flowers are responsible for immature and tender pods. It takes nearly 60 to 100 days from the time of fertilization to the complete development of the pods. The study of oil formation in the kernels is very interesting. The rate of oil formation is rather slow in the earlier stages. The curve of oil formation does not follow a parallel course with that of the transference of the materials from the shell to the kernels. The acid value is high at the time the pods start developing and is very slow in the mature seeds with a rapid fall in its value between 32 and 53 days. The oil is synthesized from the free fatty acid. If the groundnut is harvested a week before the pods are mature, the percentage of oil will be reduced by about four to five and the free fatty acid content will be increased appreciably.

Besides these, studies on the root system of different varieties were in progress.

- (ii) *Gingelly*.—To find out the suitability of the different varieties to different seasons, 54 varieties were sown in these seasons.
- (a) *Varieties*.—"Sattur" and "Anakapalle" varieties were found to be most promising among the short-duration irrigated gingellies. Some of the medium-duration varieties from Malabar are promising.
- (b) *Hybridization and Selection*.—Out of 150 single plant selections about 50 are promising. About 61 fresh selections were made during the year.
- (iii) *Castor*.—Along with study and selection of castor, Eri silk culture was introduced on the farm for the first time this year.

## (6) Root Crops.

22. *Potato*.—Investigation on the potato is confined to the Agricultural Research Station, Nanjanad. During the early years when several varieties had been imported into the station, several of them got mixed which has now necessitated purification of stock. Single plant selection work was also undertaken.

The early crop intended for the Annual Flower Show suffered from lack of rains and growth was slow in spite of constant irrigation. The average yield was only 5.36 fold, although King Edward gave as much as 9.70 fold. The main crop, in spite of the fact that it suffered from a virulent attack of *alternaria*, gave an average yield 8.94 fold, which is by far the highest obtained ever since the opening of the station.

The average yield of the second crop was 4.39 fold as against 3.9 of last year, but unlike last year the new seed took longer to germinate. The crop raised by cultivators in this season on the Nilgiris was badly diseased while the farm crops were conspicuous by its absence, as a result of the improved methods in cultivation.

Experiments on different manures, size and spacing, planting cut and whole setts, comparison of new seed with old seed, spraying against *alternaria* were in progress at the station.

The cereal crops like ragi, cumbu, samai, wheat and barley grown in rotation with potato did but fairly during the year. A very good crop of lupin was raised after the main crop of potatoes.

## (7) Spices and Condiments.

23. (1) *Pepper*.—This crop is grown in Taliparamba where the season was more favourable for it than last year. The yield obtained during the year was 2,364 lb. as against 715 lb. last year and 6,010 lb. in the year previous to it. Out of 30 acres that are under this crop in that station, only 16 acres are in their prime, the rest being either too young or too old. Manurial experiments on pepper were continued. There are two series, limed and unlimed in each of which nitrogen, phosphorus and potash are applied in different combinations. It is too early to comment on the results so far obtained as there are vines which have not yet begun to bear; but the impression is that the limed series looks better than the unlimed and in the former a larger number of vines have come to bearing. The investigation on "*pollu*" was continued. This year's result shows that the spike fall is mostly due to unfavourable weather conditions. *Pollu* due to insect attack was greater than that due to the fungus.

(2) *Chilly*.—Work on this crop is mainly confined to the Agricultural Research Station, Guntur. The damage due to thrips was not so great this year and an average yield of 738 lb. dry chillies was obtained per acre. Selection work with a view to evolve thrip resistant strains was continued. One hundred and fifty fresh

selections were made this year. Varieties obtained from Pusa, Gollaprolu and Bobbili were resistant to thrips. An experiment devised to control thrips has been in progress during the last five years. It showed that tobacco dust was the most effective of all the insecticides tried. The use of tobacco dust this year has however not resulted in profit. Reference was made last year to the popular belief that growing chillies continuously on the same land without rotation not only increases the yield but also improves the soil fertility. An experiment started last year to test this was continued this year. It was found that the crop was least affected by thrips and a yield of 1,002 lb. was obtained as against 247 lb. last year. In other fields where the crop is grown with other crops in rotation, the yields range between 500 and 600 lb.

#### (8) Sugarcane (*Sacharum officinarum*).

24. A great stimulus to the cultivation of this crop was given throughout the Presidency, thanks to the duty on sugar. Nearly all the agricultural stations cultivated a large number of varieties of sugarcane. The Agricultural Research Station, Anakapalle, showed the greatest activity in sugarcane research. A varietal study according to manurial and irrigational requirements has indicated that the two best canes were M.A. 21, a seedling cane raised at Anakapalle under liberal manurial and irrigational treatment and Co. 213 under restricted conditions. The latter, a seedling cane from Coimbatore, is being grown elsewhere too as a drought resister and has been the most popular of all.

At Samalkota, 34 new seedling cane varieties have been studied where also Co. 213 is most promising.

At Palur, Anakapalle, Samalkota and one or two other stations, sorghum hybrids were under preliminary trials. While at Anakapalle these seem to take as long as 9 months to mature, at Palur, the same varieties seem to be ready in  $7\frac{1}{2}$  months. These crosses have a great future as it would be possible in the same year to raise another crop following sugarcane. In other farms these seem to mature between seven and eight months.

Experiments are also on hand at several stations to find out whether varieties other than sorghum hybrids have more than one ripening season as is known to be the case in a few areas and what are the most suitable months for growing different varieties in different tracts.

*Agronomic Studies.*—In an irrigation experiment at Anakapalle it has been found that by irrigating only at the time of planting, Co. 213 under February and April planting gave 37 and 52 per cent increase in yield over J. 247, respectively, while in M.A. 21 the increase was 15.5 and 33 per cent respectively. Other experiments at Anakapalle were in regard to spacing, method of planting and wrapping, etc.

At Samalkota, apart from a variety of experiments in progress already, new experiments consisted of (i) shallow trench planting versus bed planting, (ii) treating setts with lime water, tepid water and prolonged soaking in cold water, (iii) planting setts eye to eye and obliquely compared with normal end-to-end planting with a view to test their effect on germination, and (iv) spacing in rows. Manurial experiments were in progress here as well as at Anakapalle and Palur. At the latter station, the experiment has been in progress for the last five years which indicated that Fiji B, the local standard variety, responds most to heavy manuring of 200 lb. nitrogen per acre in the shape of oil cake and ammonium sulphate in the proportion of 3 : 2. It is also found that the application of manuring in three doses is preferable to applying it in single or double doses. The efficacy of ammonium sulphate for cane as compared with groundnut cake when either was tried in conjunction with farm yard and other organic manure was demonstrated at Anakapalle. Ammonium sulphate gave an average net profit of Rs. 63 per acre as against Rs. 22 for groundnut cake during the last four years.

A rotation experiment has been in progress at Palur for the last nine years. The results have shown that it is detrimental to the soil to grow cane in alternate years and that it is more economical to grow it once in three years, while good yields are obtained by growing it once in four years.

Sugar manufacture under ryots' conditions was demonstrated at Anakapalle and Palur with success. Rab was prepared on the Rohilkhand bel, Sindwahe and Godavari furnaces and centrifuged.

#### *D.—Entomology.*

25. Among the special investigations on which work was continued during the year may be mentioned the paddy stem-borer, the rice grasshopper, coconut beetles, thrips on chillies, hairy caterpillar of dry crops, cotton boll worms and the blackheaded caterpillar of coconut. An intensive study of some important insect pests of fruit trees and vegetables was started during the year and progress is recorded.

Measures were taken to control pests in the College Farm and breeding stations surrounding it. To this end, trials with different patent and locally made insecticides were made. With a view to get definite data on the periodical incidence of different insect pests which have a natural attraction for light, light traps were kept regularly at nights during the greater part of the year. Information has been gathered on the periods of emergence of such pests as paddy stem-borer, cock-chafers, groundnut surul, ragi white borer, hairy caterpillar moths, etc. This section also deals with quarantine and fumigation work. About 130 lots of various seeds were examined for fumigation and for issue of pest-free certificates intended for Ceylon, Malay, Great Britain, Germany, Africa, Australia, etc.

Reference was made last year to an apiary started during the year. This has now taken a definite shape. The strength of the apiary was from 20-30 hives of the common Indian bee. During the summer months tamarind flowers were the main source of honey, pasture being scanty between June and September, after which there was no dearth for food, flowers of crops like cholam, gingelly, safflower, Cambodia cotton supplying the necessary honey. Between December and March, 100 lb. of honey were extracted from about a dozen hives. Research work on the various aspects of bee-keeping was started. The apiary attracted the attention of many visitors from whom there was a big demand for colonies, hives and honey extractors. Arrangements were made to meet this demand. Two apprentices were under training.

The rearing of eri silk worms was started during the year. Eight broods were reared and the bionomics of the worm and the economics of the work as a cottage industry were studied. Several members of the district staff were trained by the Sericultural Expert at Samalkota and Madras in eri silk rearing and were posted to the agricultural stations with a view to teach ryots interested in this new and interesting side line. Unfortunately the difficulty of marketing the cocoons has been in the way of the spread of eri-silk culture.

#### *E.—Horticulture.*

26. The Botanic garden at Ootacamund and Coonoor continued to be popular among the visitors from the plains. In addition to maintaining the conservatories, nurseries and pleasure grounds in good order, several improvements were undertaken; the most important being the re-arranging and planting of the rockery immediately below the upper conservatory and the re-building of a portion of the revetment supporting the terrace on which the conservatory stands and converting it into a wall garden.

In all, 587 packets of seeds were sown and innumerable plants were raised by vegetative reproduction. Among the plants of economic value raised in the glass houses include a number of *Nephelium lappaceum* (Rambutan) some plants of a new variety of Avocado (*Persea gratissima*) and seedlings of *Ilex paraguayensis* (Yerba Mate or Paraguay tea). Among the new trees and shrubs that were planted in the different parts of the garden mention must be made of the four Rhododendrons presented by Lady Beatrix Stanley. With a view to create new hybrids and varieties a number of cross pollinations were effected between different species and varieties of ornamental plants. The results are encouraging. Abutilon Var "Golden fleece" X Abutilon Var "Pink" have produced orange coloured flowers in two different varieties.

In the Sim's Park Garden about half an acre of jungle below the lake bund was cleared and the site was planted up with ferns and other foliage plants and the lake margins with Azaleas, Cannas, Kniphofias.



Twenty-one new species of trees and shrubs were planted during the year in different places of the garden.

*F.—Implements.*

27. Of the three types of ploughs, Cooper Nos. 11, 25 and 26 which have been approved by the department, No. 11 underwent modification to the extent that it has been equipped with a cast iron frog and cast chilled landside in place of the existing steel parts with a view to ensure economy in the initial price of the plough. Initial cost plays an important role with the Indian cultivator, and efforts are made to keep it low without sacrificing efficiency. The Research Engineer is of the opinion that No. 11 selling as it does at the low price of Rs. 6 should, before long, replace No. 25 which is much less efficient though the difference in price between the two is only Rs. 2-8-0 in favour of the latter.

Two turnwrest ploughs were under trial in the black soils of Bellary district. The Research Engineer was engaged in testing the efficiency of several types of water lifts sent to him for trial, and in experimenting with simplified designs of the Persian wheel type which has achieved some success.

A new "hurricane" winnowing machine obtained from England at a cost of Rs. 190 was put to test, and it is opined that for Indian conditions, a stronger and a more durable pattern would be necessary.

A ball bearing mhote wheel manufactured by Messrs. P. S. G. & Sons Charity Industrial Institute, Coimbatore, has been approved after trial and is priced at Rs. 10-12-0 as against the roll easy mhote wheel of Messrs. Kirloskar & Co., hitherto sold at Rs. 14 per wheel.

*G.—Livestock.*

28. In view of the abolition of the Livestock Research Station, Chintaladevi, and the Buffalo Station at Guntur, work in this section was confined mainly to Hosur. The supervision of the dairy herd at the College was transferred to the Principal. Small herds of cattle for purposes of milk to the farm staff and production of calves for sale to the public were maintained at several agricultural stations.

As in previous years work progressed in the improvement of the four important breeds, namely, the Kangayam, Ongole, Scindhi and Cross-breds. The total number of livestock at the end of the year including breeding bulls at Madras was 614 as against 904 last year. This large reduction is consequent on the orders of Government issued for the curtailment of the activities of this section.

*Cross-bred Herd.*—A number of cows of this breed was sold and some transferred to Coimbatore for the College Dairy. An experiment on breeding half-bred to half-bred which has been going on

since 1919 has been closed during the year. The results may be summarized as follows:—

- (1) The calves of the second and third generations did not grow as well as those of the first generation. This may be due to the fact that the latter suckled their dams while the former were hand-fed.
- (2) There was a tendency for the age of the cows at first calving to increase in the second to fourth generation when compared with the first generation cows.
- (3) Compared with the foundation herd of Scindhi cows the cross-breds gave a higher yield of milk per day ranging from 3-5 lb., but the increase was more noticeable in the first generation than in the second and third. Fifty per cent of the first generation cows gave over 6,000 lb. of milk in a lactation as against the yield of 3,431 lb. of the original Scindhi herd. The second and third generation cows have respectively yielded 4,068 and 4,151 lb. during the same period.
- (4) The height and weight measurements decreased slightly in each generation and appeared to be reverting to the Scindhi mothers.

These cows are now served by Scindhi bulls in order to breed back to the country herd.

*Ongole Herd.*—There is very little demand for this breed at Hosur and the animals themselves do not thrive well in this tract. It has been decided to discontinue maintaining this breed here. There were only eight cows on the average each of which yielded 10 lb. of milk per day.

*Scindhi Herd.*—This breed thrives in this locality and the breeding bulls are primarily intended for the improvement of the poor cattle of the West Coast. There were 24 cows during the year which yielded on the average 12.6 lb. per cow a day. The farm bred heifers show a slight tendency to improve in their performances at the bucket as compared with their dams.

*Kangayam Herd.*—The demand for bulls of this breed continues to increase and it is found not possible adequately to meet it. Being a notable draught breed, its milk yield continues poor, though a very slight improvement is noticed when compared with the foundation herd.

*Breeding Bulls.*—The seven breeding bulls maintained at Madras performed 573 services during the year. There were 71 bulls under the premium scheme at the beginning of the year and 72 at the end of it. There is a very large demand for premium bulls, and an increase of grant for this scheme is clearly needed.

*Sheep.*—There were 134 sheep in the flock. The improvement of this flock which was originally transferred from Bellary has not

so far achieved much success. The object is to evolve a pure white or a white black faced breed which would yield a good fleece of wool and fatten quickly. The pure white lambs are constitutionally weak, while the black faced are better, but their wool production is less. The white sheep are about 6 lb. less in weight than the others.

*Poultry.*—Six different breeds were maintained at Hosur. While white leghorns are the heaviest producers of eggs, with an average of 184 per pullet per annum, the Black Minorcas lay the largest egg. The size of eggs of the country hens is just over half the size of those of the imported breeds, and it is clear that the aim should be to improve the former by careful grading, which is likely to be accomplished in about five or six years.

#### H.—*Mycology.*

29. This section deals with those diseases of crops which are caused by fungi—

- (i) *Paddy.*—Studies of the disease known as the “foot rot” on paddy and treatment for the same were continued. Good results have been obtained by treating paddy dry with Granosan and Ceresan and wet with Uspulum, formalin, copper sulphate, mercuric chloride and hot water.
- (ii) *Sugarcane—Mosaic.*—The experiment to study the relative resistance of different varieties to sugarcane mosaic was continued. Twenty varieties of canes were grown inter-stripped with rows of diseased Co. 213 material. Of these eight varieties proved highly resistant while four proved highly susceptible.

The experiment to determine the loss due to the attack of mosaic was repeated and the results obtained are in conformity with those obtained last year. The reduction in sucrose is not so marked but the reduction in weight of canes is considerably higher.

- (iii) Studies on wilt on plantain, redgram, betel vine leaf spot and fruit rot diseases are in progress.

#### I.—*Trial Plots.*

30. There were during the year about 130 trial plots conducted on paddy, ragi, sorghum, sugarcane, cotton and groundnut. In paddy in the I circle, trials were conducted in 11 centres in the East and West Godavari districts. A strain from *Krishnakalukalu* gave from 80 to 100 per cent increase over the standard. In the Kistna district, a *Kusuma* strain gave 16 per cent increase over the local. In Guntur district, strains from *Kusuma* and *Vankisannam*, gave equally encouraging results. In the IV circle, Co. 5 and Co. 7 were under trial, the latter being found preferable to the former. G.E.B. 24 as a drilled crop yielded 18 per cent more than the broadcast local paddy in Palmaner and Wallajah taluks. Similar trials were successfully made in paddy in the V circle.

In the I circle, *punasa ragi* strain No. 525 gave an increased yield of over 21 per cent over the bulk. In the IV circle, it has been proved that T. 8 and E.C. 593 are decidedly better than the local varieties but are late in maturity by about two to three weeks. E.C. 47 tried at Palni, gave a disappointing yield. It was badly affected by *Piricularia*.

In cotton, No. 171, a strain from the Cocanadas was tried for the first time in the district in the II circle. When sown in September, there was not much difference in yield, while it gave 20 per cent increase over the local variety when sown in October. Comparative trials in C. 7, A. 10 and S. 46 were continued in three centres in the VI circle with varying success.

In sugarcane, in South Arcot district, Co. 213, Co. 281 and B. 247 were tried. B. 247 gave the best result with an acre yield of 44 tons as against 40 and 32 tons respectively of Co. 213 and Co. 281. The trials made in sugarcane varieties in Chittoor did not give any conclusive results and will be continued next season.

Two varieties of potatoes—Great Scot and Royal Kidney—from the Nanjanad Potato station were tried with success at Kodaikanal.

#### V.—DEMONSTRATION.

31. The concentration of demonstration work in a few selected centres which was begun in 1930-31 due to a change in the policy of the departmental methods of demonstration was continued during the year under report. A demonstrator cannot entirely neglect the area of his jurisdiction outside the central villages. The present arrangement is that he works in the central villages regularly and visits other villages only when called for. In the year under report, there has been extension of work, e.g., in regard to the production and supply of paddy and cotton seed and in regard to sugarcane cultivation and there have been more calls on the time of the demonstrator for work outside the central villages than before. It seems to me that the time has come when the intensive work of the demonstrator should be extended to more than three or four central villages. Experience has shown that while a demonstrator is needed to make intelligent propaganda in a village there is also need for a demonstration maistri in continuous touch with the village who can get the things done which the ryots agree to do. Again, the undoubtedly valuable research work that is being done in the department is not at present fully effective for want of a connecting link between the demonstrator and the villagers in the 200 villages or so of his jurisdiction. It is felt that if each demonstrator is given, say, eight demonstration maistris who are put in charge each of five villages, intensive work may be done in 40 villages at a time, and, after this is done for two or three years, a fresh batch of 40 villages may be taken up. Thus in 10 to 15 years, all the villages in a taluk may be covered.

*A.—Demonstration Plots.*

32. As in the previous two years, the demonstration plots were mainly confined to the centres of work and totalled 2,733. The demonstrations related chiefly to specific items of improvement on crops like paddy, sugarcane, ragi, fruit, cotton, etc. The main items included demonstrations in ploughing, intercultivation, manures and improved strains.

*B.—Exhibitions and Shows.*

33. The help of the department was invoked as in the past on occasions such as Co-operative and District Conferences, Health and Baby Week celebrations. These opportunities were as far as possible utilized for arranging exhibitions. The various village fairs, festivals and jamabandi camps also provided opportunities for conducting smaller shows for the benefit of the rural population. There were in all 168 such exhibitions and shows as against 150 in the previous year. As is usual on such occasions popular lectures on agricultural subjects were delivered by the demonstration staff mainly with the aid of lantern slides. About 500 lectures were delivered during the year.

The three motor units continued their itinerary throughout the Presidency except in the Nilgiris, spending about four months in each circle. One of the units toured in Coorg for a week. Officers of the Veterinary, Fisheries, Industries and Public Health Departments continued to co-operate with this department by accompanying the vans and bringing to the notice of the ryots the propaganda activities represented by the departments concerned.

*C.—Items of Propaganda.*

(1) Crops.

34. (a) *Methods of cultivation.*—In regard to the reduction of seed rates in sowing, the chief crops concerned were paddy and sugarcane. In the case of paddy, the improvement is being demonstrated for several years and in a number of districts and a considerable reduction has been effected. The seed rate adopted however varied from district to district. Owing to the bad season, a setback was received in the attempt to reduce the seed rate in the Vizagapatam district where the practice is to sow 1,500 lb. of seed per acre of seed bed. However, 1,368 acres of seed beds were sown at a reduced seed rate in that district. In the third circle, the seed rate was reduced by about one-third on an area of 26,750 acres. The reduction of seed rate in the VI circle was as much as 50 per cent, i.e., from 30 m.m. to 15 m.m. The practice of planting seedlings in twos and threes is spreading, especially in Godavari and Vizagapatam districts where the area thus treated was 28,096 and 11,960 acres respectively. The employment of iron ploughs instead of the time-honoured wooden ones is becoming popular in several districts. In regard to sugarcane, improved methods of cultivation include line planting, trenching and wide spacing. The

practice of planting sugarcane in lines and also of wide spacing is increasing in the I circle while wide spacing and the use of deep furrows are becoming popular in the III circle, the area affected in the Bellary and Anantapur districts being 345 acres as against 45 acres in the previous year.

By raising sugarcane seed from "short crop," i.e., using the immature cane as the planting material when the crop is six months old, it was found in the previous year that in Vizagapatam the germination improved by 10 per cent and the yield by 15 per cent. During the year under report, an area of 34 acres was "short cropped" as against two in the previous year in Vizagapatam, while in the II circle short planting for supply of seed material was introduced in select centres.

Drill sowing of dry crops has made some headway in the south. The area under drill cultivation in the VI circle alone was 17,000 acres.

Dibbling Cambodia cotton seed in lines was continued by the ryots of the VIII circle.

In the I circle, the method of sowing groundnut in every furrow instead of in alternate furrows has resulted in an increased yield of 20 per cent, the area sown being 106 acres.

(b) *Methods of Manuring.*—Green manure supplemented by bone-meal or superphosphate for paddy and oil cake in conjunction with ammonium sulphate for sugarcane were recommended as before. But owing to the economic depression, the demand for phosphatic manures and oil cake was less than in the previous year. The manuring of fruit-trees also received attention. Demonstrations in manuring potatoes with artificial manures in addition to farm-yard manure in the VIII circle gave 40 to 50 per cent increased yields over local manuring, yielding an extra profit of Rs. 18-30 per acre.

(c) *Seed Distribution.*—Distribution of improved strains evolved by crop specialists has all along been one of the main lines of activity of the department. The greatest progress made so far has been in the most important crops, paddy, cotton and sugarcane. To a limited extent efforts are made in the case of millets also.

*Cotton.*—The greatest activity evinced in the production and distribution of Cambodia cotton strain was in the VIII circle, Co. 2 continuing to be the most popular strain under distribution. Through the efforts of the department, 390, 403 lb. of seed were distributed by the department. Besides this, 108, 923 lb. of co-operatively ginned seed was distributed by the ryots themselves. The seed farm area maintained by the Tiruppur Co-operative Trading Society increased from 725 acres to 2,000 acres due to the financial aid rendered by the Indian Central Cotton Committee and the Local Government. As the sale price of lint continued to be low this year also, the premium obtained for this cotton was only

Rs. 10 per candy over market prices. In the VI circle, 49,488 lb. of the same strain were distributed. In the I circle, Co. 2 was tried in several plots of wet land in the delta as a second crop after paddy. It has also been tried on garden and dry land in the Vizagapatam district. The results are awaited. The total quantity of seed distributed in the Presidency both by the department and ryots amounted to nearly 565,566 lb.

The production of karunganni seed is in the main confined to the VI circle, though 123,987 lb. of C. 7 were produced in the seed farms of the VIII circle. Both the circles were responsible for the sale of 234,957 lb. of seed.

In the Bellary district H-1 strain of the "Westerns" cotton continued to be distributed, the area under it being 1½ lakhs of acres. The quantity distributed amounted to 169,071 lb. seed including the quantity issued to seed farm ryots for sowing in the 1932-33 season. One hundred and forty bales of ryots' lint of 400 lb. each were sold with the help of the department at a premium of Rs. 12-15 per bale over local cotton.

A scheme for the extension of the area under this cotton to three lakhs of acres in five years was sanctioned by the Indian Central Cotton Committee at the close of the year.

N. 14, a strain of the "Northerns" in the Kurnool district, continued to be distributed. 111,153 lb. of seed was distributed to the ryots.

*Coconut.*—Improvements suggested for this crop are wide spacing, new varieties, intercultivation and manuring of gardens. The low price for coconut and the general economic depression militated against the extension of coconut cultivation on the West Coast; a large number of demonstration plots continued to be run, some belonging to the South Kanara District Board. 4,720 seedlings and 600 seed nuts were supplied to the ryots both in the East and West Coasts.

A demonstrator with two coolies was deputed for six months to the Laccadive Islands for demonstrating improved methods of cultivation.

*Korai Cultivation for mat-making.*—No work during the year is reported.

*Paddy.*—The progress reported in last year's report in the spread of the strains evolved and bulk selections made by the department continued to be maintained, the total amount sold going up to 280 tons as compared with 200 tons of last year and 160 of the year before. Besides the production of seed directly by the department, large areas of seed farm on ryots' land under departmental supervision were started and sufficient seed for about three lakhs of acres has been produced. Arrangements have been made for the supply of this seed to ryots. G.E.B. 24 continues to be popular throughout

the Presidency. It has made considerable headway in the Ceded districts and Malabar owing to its remarkable cosmopolitan qualities. In spite of the low prices prevailing and reduced demand for paddy, an extra profit of Rs. 10 is easily obtained for this variety owing to its superior quality and increased yield. The V circle still continues to top other circles in the matter of distribution of paddy seed. The distribution of seed through seed farms, co-operative societies and selected seedsmen during the year was 4,373,607 lb. About 3,200,136 lb. of seed has been reserved for sowing next season in the circle.

On the West Coast, Co. 3, one of the Coimbatore strains issued, is reported to be popular in South Kanara. About 48,730 acres are under departmental seed in the circle.

*Potato*.—One thousand six hundred and sixty-eight maunds of potato seed were distributed during the year, of which 980 maunds were issued under seed farm conditions. Whole tubers yielded 7,500 lb. per acre as against 3,800 lb. yielded by small cut setts and further demonstrations will be carried out.

*Ragi*.—T-8 a strain of Ragi evolved in the Hagari Agricultural Research Station, has met with varied success. In Anantapur its longer duration and the necessity for additional irrigation for two weeks without being compensated by increased yield are large handicaps to its spread. In the Kurnool division, it has given about 10 per cent increase which is valued at Rs. 3 per acre. In Guntur district however, an increased yield of 160–200 lb. per acre was obtained.

The Mysore strain H-22 has firmly established itself as a dry crop in North Salem where the area under this variety was 4,000 acres. The results of E.C. 47 in Coimbatore, one of the selections of the Millet Specialist, were again conflicting. E.C. 593, another strain evolved by the Millet Specialist, fared better and showed an increased yield over the local in the district except in Pollachi.

*Sorghum*.—The performance of A.S. 1,543, 1,575, 60 and 809 in the VIII circle was not good inasmuch as the results were conflicting.

T-1 (Hagari) was introduced for the first time in the Guntur circle. In the III circle, it gave an increased yield of 20 per cent under dry conditions and 50 per cent under irrigated conditions, over the local. 10,928 lb. of T-1 and T-6 (Nandyal) were distributed in the Ceded districts during the year as against 6,400 lb. last year.

*Sugarcane*.—J. 247 continued to be popular in Vizagapatam. Co. 213, introduced last year and which requires little or no irrigation in that district and restricted irrigation elsewhere, is another variety which is coming into prominence. An acre yield of 15–20 candies of jaggery was obtained and its quality was good. Fiji B is holding the field in South Arcot as the sugar factory at Nellikuppam prefers only this variety to any other on account of its high sucrose content, and paid Rs. 15 per ton delivered at the factory.



Other Coimbatore varieties tried in Vizagapatam and Coimbatore were Co. 243, Co. 281 and Co. 313 and sorghum hybrids : Co. 366 and 367.

The desirability of substituting sugarcane for paddy has of late been impressed on the ryots of the Presidency. The high tariff on imported sugar has stimulated the manufacture of sugar with open pans and centrifugals. The construction of Sindewahé furnaces for making jaggery in the different parts of the Presidency continued to be demonstrated. In Hospet, a multiple furnace was worked with success ; the jaggery prepared commanded a premium of Rs. 6 per candy of 500 lb. in the local market owing to its better quality.

### (2) Fodder.

35. The rapid spread of *pillipesara* in the I and II circles is a noticeable feature of the year. Owing to the great demand for this seed, merchants have taken up the supply in the II circle. An area of 18,197 acres was put down to various fodders in the I circle, an increase of 6,000 acres over last year. The cultivation of fodder crops like *Kolukkattai* grass, elephant grass, Guinea grass, sunnhemp and *pillipesara* was advocated as in the previous year and several consignments of seed and slips were supplied. Silage manufacture was demonstrated in the VII and VIII circles and 15 pits were constructed.

### (3) Fruit.

36. Propaganda was continued to be done on the chief fruits, plantain, sapotas, citrus and mangoes and assistance was also afforded in regard to other fruits. Notwithstanding the fall in prices of plantain, an area of 2,410 acres as against 1,200 acres last year was put under this crop in the Godavari delta. Attempts have been made to keep the plantain growers in the V and VI circles in touch with purchasers in North Indian cities like Delhi, Agra, Patna, etc., but so far the high railway freight has been in the way of an extension of trade. The railway authorities too have been approached with a view to reduction of freight and quickening of transport. 1,133 citrus seedlings raised at the Agricultural Research station, Anakapalle were sold and 10,805 fruit trees of mangoes, sapotas, cashewnuts planted in the I circle. Special attention was paid in other circles also to the propagation of fruit trees and plants of several varieties were planted. 34,412 fruit seedlings and suckers—mostly suckers of pine apples—were supplied in the VII circle.

The extension of the area of cashewnut was foreshadowed in last year's report. Its cultivation was extended to the II circle where 200 lb. of seed was distributed in new areas ; considerable progress was made also in the VI circle where as many as 20,000 trees were planted. Unfortunately the market for cashewnut has considerably gone down. Grape vine cultivation was introduced in eight villages of the Godavari district.

A demonstrator conducted a survey of the fruit areas in the IV and III circles.

(4) Implements.

37. The number of demonstrations conducted with different kinds of ploughs and H.M. Guntaka rose from 5,000 last year to 6,800, the VI circle claiming as many as 1,700 to its credit. Demonstrations with Roll Easy Mhote wheels, Archemidian screws for lifting water were also conducted. Although the number of ploughs and other important implements purchased by the ryots cannot be correctly stated, as far as the departmental figures are available, the number sold in each is given below :—

Bund formers	..	29	Chaff cutters	..	16
H.M. Guntakas	..	83	Mhote wheels	..	60
Iron ploughs	..	1,394	Buckscrapers	..	5
Sugarcane Mills	..	88	Archemidian screws	..	10

(5) Livestock.

38. The three bulls maintained in the Agency were not in demand and they were therefore withdrawn during the year. There were 71 bulls under the premia scheme at the beginning of the year. Twenty-eight new bulls were approved, of which 13 were farm bred. Twenty-seven bulls were removed during the year, the majority of them having completed their three years under the scheme. The number of premia bulls at the end of the year was 72. In addition there were 127 bulls at stud including those at research stations, jails and Veterinary hospitals. The improvement of breeds of poultry continued to receive the attention of the department. Several hundreds of eggs for setting as well as chicks of good breeds were supplied to the ryots.

(6) Loans.

39. The following statement shows the number and amount of loans sanctioned during 1932-33, for the purchase of implements :—

			NO.	RS.	A.	P.
Ploughs	..	..	31	120	12	0
Persian wheels	..	..	2	900	0	0
Sugarcane power crushers	..	..	2	700	0	0
Roll easy mhote wheel	..	..	1	41	12	0
Total			36	1,762	8	0

(7) Manures.

40. *Farm-yard Manure.*—During the year the number of manure pits maintained in the I circle rose from 3,800 in the last year to 5,278 which is by no means a small achievement. Demonstrations in this line of improving the methods of manure preservation were continued with vigour. The total number of manure pits maintained at the suggestion of the department amounted to 9,962, besides which there were 2,378 dry earth sheds, 96 byres and 47 loose boxes.

*Compost.*—Along with the propaganda for the proper methods in the preservation of farm-yard manure, the utility of preserving all organic matter in the shape of waste litter, fallen leaves, stubbles, trash and weeds was impressed on the ryots. At the instance of the department, 617 compost pits were made during the year as against 650 in the last year.

*Green Manures.*—These comprise mostly dhaincha, sunnhemp, wild indigo, indigo and pillipesara. The demand for pillipesara in the Godavari delta was great and a quantity of 1,700 tons was produced for distribution there. The V circle has made a fair progress in the production and distribution of green manure seed, especially wild indigo. About 20 tons of seed were sold by the department and 100 tons were purchased by the ryots either direct or through co-operative societies in that circle. The total quantity of all the green manure seed distributed to ryots amounted to 380 tons as against 174 tons last year.

*Artificials.*—There was a decline in the use of oil cakes and the demand for fertilizers was practically nil, except in the II circle, owing to the economic depression. Two thousand two hundred and sixty pounds of bone meal were sold in the II circle by the department and very good business was done in that circle by the firms dealing in fertilizers.

#### (8) Pests and Diseases.

41. The special demonstrators in Mycology and Entomology attached to most of the circles carried on demonstrations dealing with various insect pests and diseases. A new device against smut on sorghum was demonstrated with success in the II circle by using sulphur dust in place of copper sulphate. Dust for 100 acres was distributed free. After the introduction of the cochineal insect, prickly-pear is fast disappearing in the Presidency. In the IV circle, 4,000 coconut trees were saved from damage by *Nephanthis Serinopa* by the introduction of parasites. During the year, another serious pest on coconut, the slug caterpillar, broke out near Chowghat in Malabar and timely control measures were taken. Mildew on grapes in the V circle was kept in check by the timely spraying of bordeaux mixture.

#### D.—Work through other Agencies.

##### (1) Co-operation.

42. As desired by Government in their orders on last year's Administration Report, the improvements effected in each circle through co-operative societies are recorded below.

Through the Loan and Sale Society at Anakapalle in the I circle it was possible to sell Rs. 33,455 worth of jaggery. Twenty-one hundredweights of paddy seed were distributed through the co-operative society in Chodavaram sub-circle. The Atehanta

co-operative society in West Godavari district purchased 106 bags of sunnhemp seed and distributed it to 40 members at the instance of the Agricultural Department.

In the second circle in the spread of the practice of green manuring, the assistance of co-operative societies was enlisted. Eight hundred pounds of wild indigo and 328 lb. of dhaincha seed were supplied through them. At the instance of the department, about 30 acres of paddy crop were manured with bone meal and ammonium sulphate by the Adi-Andhra Co-operative Society, Tenali.

About 44 bales of cotton were sold by the Bantanahal Agricultural Improvement Co-operative Society in third circle at a premium of Rs. 12-8-0 per bale, and a small quantity was also sold through the Tadpatri Loan and Sale Society at a premium of Rs. 8 per bale. This society also purchased 11,165 lb. of H. 1 cotton seed for distribution among its members. The Polur Agricultural Improvement Society in Kurnool district sold 71,861 lb. of N. 14 seed.

In the fourth circle with the help of the Co-operative Department and the central banks at Cuddalore and Tiruvannamalai, a scheme for the marketing of groundnut of the ryots in both South and North Arcot districts was brought into operation during the year. According to this scheme, ryots were induced to bring their produce to marketing centres like Tiruvannamalai, Tirukkoyilur, Vriddhachalam and Cuddalore where warehouses were also established. Ryots were given increased facilities in the matter of producing groundnut and in disposing of the produce. For cultivating the crop, advances were given in the beginning of the season in the shape of short term loans by the central banks through the various primary banks. The produce when ready was to be brought for sale to the marketing centres, where additional facilities were given to them to secure further advances on their agreeing to pledge the produce to the Loan and Sale Society and to store it in the warehouses engaged by it, so that it may undertake to sell the produce at a time when the market was favourable.

Out of the nine co-operative agricultural societies working in the fifth circle, all but three are functioning well. On the whole, 45,152 lb. of paddy seed and 7,857 lb. of green manure seed were distributed by the societies, and about 1,220 tons of artificial manures and two Cooper No. 25 ploughs were purchased by members through the societies.

A special demonstrator continued to be placed at the disposal of the Koilpatti Loan and Sale Society in the sixth circle and he was helpful in grading and marketing cotton and stocking pure seed. The Co-operative society at Melacheval and the Agricultural Improvements Society at Velur each purchased a breeding bull; the Dindigul Cotton Sale Society and the Velur Agricultural Society sold 23,856 lb. of cotton seed for seed purposes during the season.

In the seventh circle a meeting of the pepper growers round about Taliparamba was convened and an application for starting a loan and sale society for their benefit was sent to the Deputy Registrar of Co-operative Societies, Calicut. Demonstrators attended the meetings of the co-operative unions in their respective centres and educated the members on the activities of the Agricultural Department.

In the eighth circle, a new scheme for Co. 2 seed production, financed by the Indian Central Cotton Committee, Bombay, was started during the year by the Tiruppur Co-operative Trading Society. In this scheme, the 1,000 acres of seed farms run by the Agricultural Department is called the "inner area" and will supply seed to the "outer area" controlled by the Tiruppur Co-operative Trading Society with the help of the Business Manager. Last year the society handled 760 bags of Co. 2 seed and during the year under report, 2,000 acres of seed farms were under their control.

#### (2) Agricultural Associations.

An attempt was made to revive the defunct Ganjam Agricultural Association and a scheme of work was drawn up. A new Association styled "The Chamber of Agriculture" for South Arcot was formed at Cuddalore during the year. The plantain grower's section of the Trichinopoly District Agricultural Association deputed its representative to tour in Northern India to study the market for plantains there. Fifteen village agricultural associations were started in the Trichinopoly district.

#### VI.—LEGISLATION.

43. *Cotton Ginning and Pressing Factories Act*.—This Act continued in force during the year. The number of ginning factories in the year rose from 529 to 556 of which nearly 100 did not work during the season. There was no increase in the number of pressing factories which were 67 during the year of which six factories did not do any pressing work. The number of cases of owners of ginning factories prosecuted and fined for infringement of provisions of the Act rose from seven in the previous year to 15 in the year under report.

44. *Cotton Transport Act*.—This Act also continued in force during the year. The absence of restriction on the movement of cotton by road and river continues, with the result that the object of the Act is partially defeated as Mysore and Malabar cotton is taken to Tiruppur and that from the Nizam's dominions gets into the districts of Bellary and Kurnool. To prevent to a large extent the irregular transport of Cocanadas into the Kurnool district, the northernmost railway station in the Northern and Western tract, viz., Cumbum which was near to Tarlapaud in the Cocanada tract was changed to Chilama. This is 44 miles from Cumbum in the interior of the Kurnool district and the range of hills and rivers

between these places will now render the transport by road difficult and unprofitable. Steps have been taken to try Ceylon cotton in Malabar to replace the local inferior cotton. The general question of controlling irregular transport of cotton by road and river was considered in all its aspects. It is found to be not feasible without considerable expense to check entry of cotton by road. Bombay has found it possible to open check stations only on main roads but that is not enough.

*Single licences by rail.*—Twelve were issued against 13 in the previous year, of which 10 were for import into the "Southern" area and two into the "Northern" area.

*Annual licences.*—Twelve licences with 268 certified copies were issued for use by mills in the "Southern" area as against 11 licences and 328 certified copies in the previous year. Only 217 copies were used as against 262 of the previous year. In addition, six licences and 98 certified copies have been issued from 1st February 1933 to 31st March 1933 to the mills in the Southern tract.

*Import by sea.*—Fifty-six licences were issued for the import of 31,891 bales of cotton into Tuticorin as against 87 licences for 49,675 bales in the previous year.

The Cotton Control Act passed at the close of last year prohibiting the cultivation and mixing of pulichai (*G. neglectum*) cotton and its sale was not strictly enforced during the year as seed for sowing had been obtained by ryots before the provisions of the Act and rules were widely published and circulated. The publication and circulation of a note about the provisions of the Act and warning the ryots that the Act will be rigorously enforced next season will, it is hoped, have a salutary effect.

45. *Cotton Market.*—A Bill to provide for the establishment and the better regulation of markets for commercial crops in the Madras Presidency was passed by the Legislative Council at the close of the year. The question of selecting Tiruppur as the first notified area for cotton under the Act is under consideration.

46. *Pest Act—Agricultural Pests and Diseases Act III of 1919.*—The Act was in force during the year in respect of diseases and insects affecting cotton, groundnut, palmyra palms and also for the eradication of water hyacinth—

*Cotton.*—The Act was enforced in respect of the two insect pests, stem-weevil and pink boll worm attacking Cambodia and *Pachanadan* cottons in the Coimbatore, Salem, Trichinopoly and Madura districts. The ryots on the whole have realized the benefits of the working of the Act and have of their own accord removed the plants though with some delay in some cases. In Trichinopoly, with the exception of a few cases, the crop was removed before the stipulated time. There was delay in Madura district owing to favourable rains in July-August. One hundred and seventy-six

prosecutions were launched in Periyakulam, Tirumangalam and Palni taluks. Considerable improvement was noticed in Coimbatore district in the eradication as on the 1st September the standing area amounted to only 256.56 acres as against 928.9 acres last year. In Salem the eradication was completed before the 31st August. There were only three defaulters in Rasipur taluk.

Ryots of Thoraiyur and Angalakurichi wanted their villages to be excluded from the operation of Pest Act and the question is being examined.

*Groundnut.*—The Act was enforced against the Red Hairy Caterpillar pest (*Amsacta Albistriga*) on groundnut in Vriddhachalam, Kallakurichi and Tirukkoyilur taluks of South Arcot district, in Tiruvannamalai and Polur taluks of North Arcot district, all the Government, inam and zamin villeges of Andimadam, Jayakundam and Manapathur firkas of the Udayarpalaiyam taluk in Trichinopoly district, and Salem and Rasipur taluks of the Salem district.

In the South and North Arcot districts, the pest appeared in varying degrees of severity and when action was taken by the ryots in time, they were able to save the crop. In Udayarpalaiyam taluk of Trichinopoly district the ryots have generally understood the benefits of the Act and have co-operated in carrying out the remedial measures. In Salem and Rasipur taluks, the pest appeared this year in a mild form and the Act had only to be enforced in a few villeges. The ryots are becoming more and more alive to the necessity for taking prompt action immediately the pest is noticed.

*Palmyra.*—The Act was enforced in respect of Budrot of palmyra in the Palghat taluk, Malabar district, from the beginning of March 1933. The disease has spread throughout the Palghat taluk. A Sub-Assistant was specially stationed in the taluk to carry on propaganda work in connexion with the control of the disease. By persuasion, about 2,500 diseased trees were cut during the year. The disease appeared on coconut in about 30 gardens in the interior of Kottayam taluk. By prompt action 151 diseased trees were cut and 56 trees were operated and the disease was brought under control.

The Act is also in force in East and West Godavari, Kistna and Guntur districts. The demonstrators in these tracts are giving advice to the ryots regarding the remedial measures to be taken. They are also advised of the evils which would follow if they failed to take remedial measures. The percentage of affected trees in Razole taluk is reported to be high and it is suggested by the Assistant Director of Agriculture, Rajahmundry, that it would be better if the Pest Act is enforced in Razole and Amalapuram taluks. The Collector of East Godavari has been addressed in the matter.

*Water Hyacinth.*—The Act is in operation in districts of Ganjam, Kistna, Guntur, South Arcot, Tanjore, Madura and Malabar for the eradication of water hyacinth from water sources.

## VII.—PUBLICATIONS.

47. The undermentioned leaflets and bulletins were published during the year 1932-33 :—

Subject.	Languages in which published.	Price.
<i>Leaflet Series.</i>		
2. Conditions to be fulfilled for the grant of premia for breeding bulls.	Tamil, Kanarese and Malayalam published in 1931-32).	Telugu, (English and Malayalam in
17. Improvement of sugarcane seed .. ..	English .. ..	Free.
31. The mosaic disease of sugarcane .. ..	Tamil .. ..	Do.
34. Sprayers and spraying .. ..	Tamil and Kanarese.	Do.
36. Bud rot of palmyra .. ..	English, Kanarese and Tamil.	Do.
37. Mildew on grapes and how to prevent it ..	Tamil, Telugu and Kanarese.	Do.
38. Water hyacinth .. ..	Telugu, Malayalam, Kanarese and Oriya.	Do.
39. The Deccan grasshopper .. ..	English .. ..	Do.
40. Swarming caterpillar of paddy .. ..	Tamil, Telugu, Kanarese and Malayalam.	Do.
41. The rice bug .. ..	Tamil, Telugu and Kanarese.	Do.
42. The rice hispa .. ..	Telugu, Kanarese, Malayalam and Tamil.	Do.
43. Smut disease of cholam and tenai .. ..	Tamil, Telugu and Kanarese.	Do.
44. Control of rice grasshopper in Malabar ..	Malayalam .. ..	Do.
45. Early sowing of Cambodia cotton .. ..	English and Tamil ..	Do.
47. Note on cashewnut .. ..	English, Tamil, Kanarese, Telugu and Malayalam.	Do.
48. Paddy grasshopper and its control .. ..	English, Telugu, Malayalam, Kanarese and Oriya.	Do.
49. Institution of prizes for calves born to premium bulls.	English, Tamil, Telugu, Kanarese and Malayalam.	Do.
<i>Notes.</i>		
8. What the ryot should do in Malabar and South Kanara to produce pure paddy.	English, Malayalam and Kanarese.	Free.
9. How to save temples and costly buildings from destruction.	English .. ..	Do.
<i>Bulletins.</i>		
23. Insects affecting the cotton plants in South India.	English .. ..	RS. A. P. 0 2 0
30. The cultivation of Coimbatore seedling sugarcane in South India.	English and Telugu ..	0 4 0



The Villagers' Calendar for 1932-33 was published as usual in English and the vernaculars and 59,860 copies were printed as shown below :—

English .. .. .	6,200
Tamil .. .. .	22,000
Telugu .. .. .	23,600
Malayalam .. .. .	5,500
Kanarese .. .. .	2,560
	<hr/>
Total .. .. .	59,860
	<hr/>

*Books.*—A handbook of some South Indian weeds by Rao Bahadur C. Tadulinga Mudaliyar was published during the year.

The third revised edition of the Manual of Elementary Botany for India by Dewan Bahadur K. Rangachariyar was undertaken during the year.

#### VIII.—STATISTICS.

48. The Committee appointed by the Government for the co-ordination of prices and other statistics concluded its labours and reported to Government that all statistical work should be confined in a central office like the Board. Government accordingly ordered the transfer of all statistical work done in this office to the Board of Revenue. The Statistical Assistant together with three clerks was transferred to the office of the Board of Revenue on the 1st November 1932 from which date all statistical work relating to crop forecasts, season and crop report, taluk and village accounts and prices is dealt with in that office.

49. *Weekly Cotton Mill and Press Return.*—There were 25 spinning mills in the year and all of them continued to send their returns of cotton received in their mills every week. Similarly returns from the 67 presses were continued to be received under the Cotton Ginning and Pressing Factories Act.

50. *Miscellaneous.*—Under orders from Government, M.R.Ry. Rao Sahib N. S. Kulandaiswami Pillai Avargal, Deputy Director of Agriculture, V Circle, was deputed to tour for a week in Ceylon to study the conditions there for the maintenance and extension of the market for Tanjore rice. The enquiry disclosed that Burma was holding the field in Ceylon on account of its ability to import cheap rice at low rates and that if Tanjore should compete with Burma, the railway and steamer freight charges should be reduced. The South Indian Railway has since reduced the freight to a certain extent.

## IX.—EXPENDITURE.

51. The receipts and expenditure for the year 1932-33 and the corresponding figures for the previous year 1931-32 are as below :—

	1931-32.	1932-33.
	RS.	RS.
Expenditure .. ..	17,73,165	16,90,668
Receipts .. .. .	2,09,536	2,02,372
Net expenditure .. ..	15,63,629	14,88,296

NOTE.—The above figures do not include schemes financed by the Imperial Council of Agricultural Research and the Indian Central Cotton Committee.

The decrease in expenditure in 1932-33 as compared with that of 1931-32 is due to—

- (a) the reduction of staff due to retrenchment,
- (b) the emergency cut in salaries and allowances of officers during the year, and
- (c) economy observed in contingent expenditure.

With regard to the decrease under receipts this is as in the previous year due to the general trade depression prevailing everywhere.

## X.—PROGRAMME OF WORK FOR 1933-34.

52. The main lines of work are indicated below :—

(i) *Research.*

## A.—Research Stations.

(1) *Botany.*—Survey and study of weeds, fodder grasses, bananas and plantain varieties of the Presidency. Investigation of spike disease of sandal, studies of *Colletotrichum* with special reference to saltations and of vermicularea species. Revision of nomenclature of sheets in collections.

(2) *Chemistry.*—In addition to analytical and advisory work, the following problems will receive special attention :—

*Soil Science.*—Study of soil exhaustion, soil recuperation, soil moisture, soil nitrogen and its fixation by micro organisms independently and in symbiosis, nature, origin and removal of soil alkalinity. Examination of the methods of estimating the pH values of soils.

*Manures and Plant Nutrition.*—Studies of the agencies responsible for the loss in the soil of added nitrogen in the form of fertilisers; study of the proper ratios in which nitrogen, phosphate and potash are required by different soils and different crops; utilization of night soil by activated sludge process and poudrette. Investigation into the use of indigenous and artificial fertilisers.

*Animal Nutrition.*—Investigation in the food values of agricultural produce to human beings, and farm animals. Determination of digestibility of different roughages and concentrates, manuring in relation to the nutritive value of crop.

*Bacteriological.*—Investigation into the possibilities of extracting oil from oil seeds by bacterial and enzymic process. Investigation into the possibilities of preparing industrial alcohol from such materials as groundnut husk.

*General.*—Analysis of insecticides and fungicides; investigation into the causes that affect the colour and keeping quality of jaggery, curing of ginger. Investigation on vegetable oils for illuminating purposes, accelerating the process of dyeing with natural indigo, the preparation of plantains for use in Europe and America, the prevention of loss of cashewnut oil in the process of roasting, sugar production of palmyra palms, the sugar content of different varieties of sugarcane, and the causes that affect the sugar content, the disposal and utilization of domestic waste particularly sewage and night soil, the industrial and commercial utilization of agricultural produce and its waste products and the utilization of molasses.

(3) *Crops*—(a) *Millets.*—Continuance of study of mode of inheritance of characters in millets and varietal survey of the sorghums; single plant selections of sorghum, *setaria* and *coracana*; experiments on dry farming in relation to millets.

*Korra.*—Improvement of yield, and selection of good yielding strains for different tracts.

(b) *Paddy.*—Maintenance of purity of strains already released; trials of progenies of promising hybrids; breeding for disease resistance; study of inherent qualitative and quantitative characters; chromosome studies of the cultivated and wild rices and their bearing on the occurrence of spikelet sterility; histological studies of the nutritive value of grains; cultural, varietal and manurial experiments.

(c) *Cotton.*—Study of the inheritance of seed and lint weights and of jassid resistance in Cambodia; study of the physiology of drought resistance, yield and rotation experiments, isolation of strains suitable to different tracts.

Investigation into the problem of (a) undeveloped ovules, (b) production of long bracts, (c) presence of fuzz, (d) the control of stem weevil and boll worms, (e) reduction in bud and boll shedding, (f) utilization of the empty pericarps, and (g) utilization of cotton stems.

(d) *Oil Seeds.*—Cultural and varietal trials of ground-nut; manurial trials and self fertilization of heavy yielders; study of coconut pollen, varietal trials of castor for seed and for leaf for eri silk

culture ; varietal trials of gingelly ; study of seedlings of cashew-nuts to select desirable types ; crossing of soya beans with local beans and pulses.

(e) *Pulses*.—Soya beans and cluster beans.—Hybridization with other pulses with a view to the introduction of the oil of the former and the prolificness of the latter into other pulses. Study of variations in lablab and horsegram and selection work on red gram and Bengal gram.

(f) *Fruits*.—Budding and grafting of imported varieties of apples on stalks of the indigenous varieties ; budding of imported varieties of plums on peaches ; propagation of Litchis and Sapotas by "Gooty" layering in addition to the usual method of budding and grafting ; budding of the "Avacado" pear on to seedlings of the same species ; research on fruit culture in the plains from funds granted by the Imperial Council of Agricultural Research.

*Miscellaneous*.—Experimental cultivation of soya bean, Gambier, Tung (*Aleurites Fordii*) and *Diospyros mollis*, besides *Lupinus termis* and Rambutan.

(g) *Sugarcane*.—Experiments to determine all the possible seasons in the year when sugarcane can be grown. Trials of medium canes and sorghum-sugarcane hybrids ; cultural experiments. Investigation into the fundamentals of cane nutrition, and in the optimum manurial requirements of Co. 213.

(4) *Entomology*.—Continuance of apicultural work, study of specific problems in circles by assistants stationed there, economic work such as testing different kinds of insecticides against various kinds of pests including pests of stored products.

(5) *Implements*.—Trials of reversible disc ploughs, cultivator's bund forming implements, tests of water lifts, seed drill and seed sower for attachment to country drill, experimentation with ground nut decorticating machines, and with improved design of jaggery boiling pan and furnace.

*Irrigation*.—Study of the water requirements of irrigated crops with V notches.

(6) *Livestock*.—Increased provision of breeding bulls through district boards as well as other agencies.

*Crossbreds*.—Breeding back of the crossbreds with Scindhe bulls.

*Scindhe herd*.—Building a herd of good milkers and breeding bulls.

*Ongole and Kangayam*.—Building a herd of animals of good draught type and fair milking capacity by selection.

*Alambady*.—Formation of a nucleus herd of this breed.

*Buffalo*.—Grading up the half and three-fourth bred by the use of pure Delhi bulls.

*Sheep*.—Building a stock of a white-breed, paying attention to improvement of yield in wool and mutton.

*Poultry*.—Establishment of flocks of imported herds for distribution. Feeding trials of food-stuffs.

(7) *Mycology*.—Investigation of foot-rot of paddy, blast of paddy, false smut of paddy, pollu of pepper, wilt in betel-vine, diseases of red gram and bengal-gram, mosaic of sugarcane, shoot-rot of coconut, die-back of cashewnut, diseases of citrus, clump and wilt diseases of groundnut, yellowing disease of cholam and panama disease of plantains; study of promising indigenous drugs with a view to their application as fungicides and spreaders.

#### B.—Agricultural Research Stations.

*Anakapalle*.—Cultural, manurial and varietal study of paddy and sugarcane; trials of strains of ragi and paddy; investigation of methods of cultivation, manurial and water requirements of sugarcane; trials of varieties of sugarcane; trial of citrus varieties; trials of Cambodia cotton and Roseum-Indicum crosses; trials of varieties of castor, gingelly, soy bean and vegetables; investigation into the damage caused by sugarcane borer and methods of control and the study of the pests of citrus and cotton, laphygma on onions and prodemia on tobacco; trial of centrifugals and sugar mills. Extension of work on sugarcane research from funds granted by the Imperial Council of Agricultural Research.

*Samalkota*.—Trial of growing sugarcane with restricted water supply; study of ratooning capacity of important canes; varietal study of plantains; study of treatment of plant materials, flowering, bunch characters, ripening and keeping qualities, effect of various doses of manures in regard to plantains; experiments with garden land crops in rotation with paddy; cultivation of vegetables with special reference to intergeneric and interspecific hybridisation; studies in flowering and fruiting of pine apple, mango and sapota; investigations on the water requirements of paddy, sugarcane, and plantains; growing of various crops in the second season.

*Guntur*.—Selection of high yielding strains of cotton; study of characters of chilly plants; selection work in chillies; manurial and insecticidal experiments on chillies; hybridisation with brinjals and similar crops to impart hairiness to the chilly plant for minimizing thrip attack; manurial experiments on tobacco and comparative trials of different varieties; study of the causes of remedies for "damping" off disease on tobacco; selection work in maize.

*Nandyal and Hegari*.—Evolution of high yielding and drought resistant strains of cotton and sorghum; trial of Cambodia as a dry crop; trial of varieties of zizyphus, pomegranate, fig, vines, and Bagdad date; sub-soil ploughing; investigation into the practical method of erecting bunds in fields with drilled seed. Selection of single plants of onion, *setaria*, groundnut, bengal-gram and chilly; experiments on grading of sorghum seed; experiments with

poudrette; experiments on retention of soil moisture and deep ploughing. Extension of work on dry farming from funds granted by the Imperial Council of Agricultural Research.

*Palur*.—Testing of varieties of sugarcane; investigations of methods of manure and of the effect of varying rotation on sugarcane and paddy; testing of strains of paddy; study of semi-dry paddies; trials with varieties of soy bean and new varieties of vegetables like tomatoes; experiments on poudrette.

*Adulhurai*.—Testing and releasing of strains of paddy; study on artificial crosses; investigation on methods of manuring paddy; trial of different varieties of canes and their seasonal plantings; plantain cultivation and plantain fig making; trial of soy beans; growing and study of vegetable crops and fruit trees.

*Kovilpatti*.—Testing of strains of cotton; investigation into the harmful effects of fodder cholam preceding cotton; suitable rotation with cotton; trial of cumbu strains; manurial trials with cotton; root pruning experiments on cotton; ragi trials; trials of *surangi* cumbu, and *bilichigan* cholam; study of irrigated crops and collection of seed; selection in coriander and pulses; study of crosses between *Indicum* and *Hirsutum*.

*Taliparamba*.—Varietal and manurial trials of pepper; investigation on the effect of mosaic on the yield of cane; study of "pollu" disease on pepper. Varietal trials of Coimbatore canes; study of the behaviour of Co. 213 cane to restricted manuring and irrigation; test of African varieties of sorghum; trial of cotton varieties and testing their suitability to west coast; trial of the African variety of cashewnut; comparison of Trinidad ginger, and Bengal ginger with local ginger; trial of tung oil and clove plants; trial of gambier seeds.

*Nanjanad*.—Varietal, manurial and cultural trial of potatoes; investigation on the keeping quality of seed potatoes. Extension of work on potato research from funds financed by the Imperial Council of Agricultural Research.

#### C.—Trial Plots.

*First Circle*.—J. 247 and Co. 213 varieties of sugarcane with a restricted supply of water, types of ragi and paddy isolated at Anakapalle and Samalkot; trial of Co.2 cultivation in wet land after paddy.

*Second Circle*.—Trial plots of paddy, sugarcane and Co.2.

*Third Circle*.—Trial of sugarcane varieties, sorghum, long duration paddy varieties and cotton.

*Fourth Circle*.—Trial of improved varieties of paddy, sugarcane and groundnut.

*Fifth Circle*.—Trial of improved varieties of paddy, Pusa variety of tobacco, Bellary onion and Periamanjil cholam. Trial of different canes and soy beans.

*Sixth Circle.*—Trial of paddy, cotton, ragi; trial of J. 247 and Co. 213 sugarcane.

*Seventh Circle.*—Trial of paddy, pepper, sugarcane, cholam, soya beans, cotton, plantains, African cashewnuts, cloves, tung oil, mango varieties and sapota.

*Eighth Circle.*—Trial of ragi, cholam, paddy, groundnut, sugarcane, Pusa and Guntur tobacco and potatoes.

(ii) *Demonstration.*

(1) *Crops.*—Strains of paddy, ragi, sorghum and cotton. Varieties of sugarcane; short planting and line planting of sugarcane; low seed rate for paddy nurseries and clean cultivation.

(2) *Implements.*—Introduction of standard types of ploughs, H.M. guntakas, drilling implements and bund formers; improved sugarcane pans.

(3) *Manures.*—Proper methods of preserving cattle manure and manufacture of composts. Introduction of green manure crop for increasing organic matter in both garden and wet lands. Use of oil-cake for sugarcane.

(4) *Seed supply.*—Increase of seed in different varieties, especially paddy, cotton and green manures.

(5) *Cattle.*—Stationing of stud bulls; advice on proper care of cattle; demonstration of ensilage, fodder crops.

(6) *Jaggery manufacture.*—Clean preparation; manufacture of sugar with the help of centrifugals.

(7) *Insect pests and diseases.*—Advice on proper methods of combating plant pests and diseases; sprayers, insecticides, etc.

(8) Demonstration plots in all centre villages in the holdings of ryots under departmental supervision.

(9) Exhibitions at important fairs and festivals; motor exhibition vans, lantern lectures.

(10) *Associations.*—Formation of agricultural or co-operative associations to take up stocking and sale of implements, seeds, etc.

(iii) *Agricultural Education.*

Continuance of the Degree course at the College; opening of short courses in agriculture for sons and relations of landlords; facilities for practical training in agriculture at Government farms for educated men who have attained roughly the S.S.L.C. standard; helping in the introduction of courses in agriculture in middle and high schools; continuation of farm labourers' schools.

(iv) *Agricultural Economics.*

Improvement in the marketing of fruit, groundnut and rice mainly through co-operative societies ; study of the cost of production of sugarcane, cotton and rotation crops ; spread of the manufacture of sugar with open pans and centrifugals ; economic survey of villages.

(v) *Extension of Agricultural Improvements.*

Provision of pure paddy seed on a large scale ; provision of pure cotton seed of Co. 2 (Cambodia) and H. 1 (Hagari) on a large scale ; extension of sugarcane area in the Presidency ; introduction of Cambodia in the Godavari Delta ; utilization of waste land, spread of agricultural improvements on a mass scale with the help of takavi loans.

I have the honour to be,

Sir,

Your most obedient servant,

S. V. RAMAMURTI,

*Director of Agriculture.*



## GLOSSARY.

Avocado .. .. .	<i>Persia gratissima.</i>
Barley . . . . .	<i>Hordeum vulgare.</i>
Bengal-gram .. .. .	<i>Cicer arictinum.</i>
Betel-vine .. .. .	<i>Piper betel.</i>
Castor .. .. .	<i>Ricinus communis.</i>
Cashewnut .. .. .	<i>Anacardium occidentale.</i>
Cholam .. .. .	<i>Sorghum vulgare.</i>
Cotton .. .. .	<i>Gossypium.</i>
(i) Cambodia cotton .. .. .	<i>Gossypium hirsutum.</i>
(ii) Karunganni cotton .. .. .	<i>Gossypium indicum.</i>
(iii) Uppam cotton .. .. .	<i>Gossypium herbaceum.</i>
(iv) Pulichai cotton .. .. .	<i>Gossypium neglectum.</i>
(v) Westerns cotton .. .. .	} Mixture of <i>Gossypium herbaceum</i> and <i>indicum.</i>
(vi) Northern cotton .. .. .	
Chillies .. .. .	<i>Capiscum sp.</i>
Coconut .. .. .	<i>Cocos-nucifera.</i>
Cumbu .. .. .	<i>Pennisetum typhoideum.</i>
Gingelly .. .. .	<i>Sesamum indicum.</i>
Groundnut .. .. .	<i>Arachis hypogæa.</i>
Grape-vine .. .. .	<i>Citrus decumana.</i>
Horsegram .. .. .	<i>Dolichos biflorus.</i>
Khaki weed .. .. .	<i>Alternanthera echinata.</i>
Kolukattai grass .. .. .	<i>Pennisetum cenchroides.</i>
Korai .. .. .	<i>Cyperus rotundus.</i>
Korra .. .. .	<i>Setaria italica.</i>
Maize .. .. .	<i>Zea mays.</i>
Mangoes .. .. .	<i>Mangifera indica.</i>
Onion .. .. .	<i>Allium sativum.</i>
Orange .. .. .	<i>Citrus aurantium.</i>
Paddy .. .. .	<i>Oryza sativa.</i>
Pani varagu .. .. .	<i>Panicum miliaceum.</i>
Pepper .. .. .	<i>Piper nigrum.</i>
Peach .. .. .	<i>Persica vulgaris.</i>
Pillipesara .. .. .	<i>Phaseolus trilobus, Ait.</i>
Plantains .. .. .	<i>Musa sapientum.</i>
Plum .. .. .	<i>Prunus salicina.</i>
Potato .. .. .	<i>Solanum tuberosum.</i>
Ragi .. .. .	<i>Eleusine coracana.</i>
Rambutan .. .. .	<i>Nephelium lappaceum.</i>
Redgram .. .. .	<i>Cojanus indicus.</i>
Samai .. .. .	<i>Panicum miliare.</i>
Soy bean .. .. .	<i>Glycine soja.</i>
Sugarcane .. .. .	<i>Saccharum officinarum.</i>
Teosinte .. .. .	<i>Euchlæna mexicana—schrud.</i>
Tobacco .. .. .	<i>Nicotiana tobacum.</i>
Tung .. .. .	<i>Aleurites fordii.</i>
Turmeric .. .. .	<i>Curcuma longa.</i>
Varagu .. .. .	<i>Paspalum scrobiculatum.</i>
Wheat .. .. .	<i>Triticum spp.</i>
Yerba Mate (Paraguay tea) .. .. .	<i>Ilex paraguayensis.</i>

# Government of Madras

DEVELOPMENT DEPARTMENT

**G.O. No. 1179, 26th September 1933**

Agriculture—Administration report—1932-33—Recorded.

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READ—the following paper :—

From the Director of Agriculture, dated 1st August 1933,  
R.O.C. No. D-68-Pdl./32.

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**Order—No. 1179, Development, dated 26th September 1933.**

There was no change in the Direction. Mr. S. V. Ramamurti continued to be in charge of the department. The department suffered a rather severe retrenchment of staff. All the statistical work hitherto carried out in the Director's office was transferred to the Board of Revenue in November 1932.

2. The agricultural middle school at Taliparamba was closed during the year, and the school at Kalahasti has not yet been opened. Middle school education has not been a success, but it is gratifying to note that the middle school maintained by the Madura District Board at Usilampatti was so well attended. There has not been the same demand for admission to the college at Coimbatore. The number of applications fell, evidently as a result of the difficulties experienced by the graduates in securing employment in this department. But the Agricultural Department is not the only career open to agricultural graduates. The Government wish to emphasize that the aim of the college is primarily to train agriculturists who will go back to their own lands and improve their own agricultural practice on scientific lines.

3. The general effect of the monsoon on the operations of the several agricultural stations was adverse, though in a few places and in respect of a few crops the season was favourable.

Research received adequate attention. Special mention may be made of the study of indigenous fodder-grass, of the study and survey of bananas and plantains and of the study of soil nitrogen.

The study of the influence of manuring on the quality of the crop is obviously of great importance. The evolution of a superior, high yielding strain of ragi, which has been favourably reported on from different centres, is also noteworthy. Three strains of sorghum at Nandyal have given a high yield. Spacing experiments have succeeded in demonstrating the possibility of increased yields and a bolder grain. Nine new strains of paddy were released for distribution to ryots and several new strains were in various stages of trial. The results of a green manure crop in rotation with cotton are very striking. Increased attention is being given to fruit cultivation. A scheme of research financed by the Imperial Council of Agricultural Research will shortly be introduced, and land for the opening of a farm in the Cuddapah district is being acquired for the purpose.

The adoption of sugarcane as an alternative crop to paddy, under present price conditions, is of particular importance. The Imperial Council of Agricultural Research has come to the help of the department in financing a scheme of research to be carried out at Anakapalle and Chittoor. Experiments were made to find varieties of cane, other than the sorghum hybrids, which have more than one ripening season. Sugar manufacture under ryots' conditions was demonstrated at Anakapalle and Palur.

The apiary at Coimbatore was definitely established and research on various aspects of bee-keeping was started. If this is successful, a further possibility of a cottage industry is apparent.

Breeding experiments in the cross-bred herd of the livestock section have been discontinued, as the progeny in the second and third generations appeared to be reverting to the Scindhi type.

Under the head of demonstration, the number of trial plots and demonstration plots rose from 120 to 130 and 2,132 to 2,733, respectively. It is satisfactory to notice that the ryots' demand for the services of the demonstrators is increasing.

Progress in the adoption of improved methods of cultivation is maintained. The quantity of cotton and paddy seed distributed has increased. But the Director has not indicated, as desired in the Government's review of last year's administration report, the total area constantly cultivated with improved strains or by improved methods to enable any definite estimate to be made of the progress achieved. The new cotton seed scheme inaugurated by the Indian Central Cotton Committee at Tiruppur will make available large quantities of cotton seed.

At the present time, the outstanding requirement of the agriculturist is improvement in marketing facilities. Improvement in the quality or quantity of the crop grown is of no avail if the increased or improved produce cannot find access to markets. A Deputy Director of Agriculture was deputed during the year to study the conditions of the Tanjore district and on his report and

as the result of further investigations, steps have been taken to reduce railway freights. Other measures to stimulate the rice trade are also under consideration. The aid of the Co-operative Department can be invoked in marketing, as witness the recent development in this direction in respect of groundnut in North and South Arcot. There is abundant scope for developing marketing in this direction. The Government hope that the Agricultural and Co-operative Departments will unite to concentrate greater attention on the question of marketing.

(By order of the Government, Ministry of Public Works)

C. A. HENDERSON,  
*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.  
,, Finance Department.  
,, Accountant-General.  
,, Government of India, Department of Education, Health and  
Lands (with C.L.).  
,, Secretary, Imperial Council of Agricultural Research (with C.L.).  
Press.