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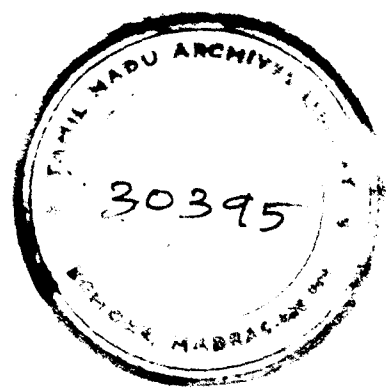

R.O.C. No. D. 68-Pdl./32.

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. Subrahmanyan 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. Ratnasabhapati 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 Tinnevelly 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 introudced 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) bunded 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, *Paspalam 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 Tinnevelly 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 *cernum*—

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 Cenchroides*), 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 mangosteens 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 Nileshwar 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

$9'' \times 9''$ 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 $4\frac{1}{2}$ 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 megnolias were grafted on to *micholia nilgirica*, both belonging to the same natural order. If this experiment proves a success, the method of raising of megnolias, 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 $\frac{7}{8}$. 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 hrees has been recommended by the department for years, so much so that this practice is naturally spreading in different circles. Whi'e 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 Gopichettipalaiyam 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 Tinnevelly 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 " Northerns " 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 $1\frac{1}{2}$ 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 agrieultural 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 Southerns area and three into the Northerns area.

Annual Licences.—Eleven licences with certified copies of 328, were issued for use by mills in the Southerns 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.
Southerns 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*.

Pest Act.

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 Udayarpalayam 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.
Leaflet Series.		
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.
Leaflet Series—cont.		
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, Vellalore, 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.

Subject.	Languages in which published.	Price.
Notes.		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.
Bulletins.		
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 Tinnevellies 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

concession rates, and the Rajahmundry merchants had to take paddy to Madras 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 by 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 1932–33.

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 poudrette.

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 *coracana* ; 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 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.

(*d*) *Oil-seeds.*—Cultural and varietal trials of groundnut ; 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 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 breds 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 Stations.

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

(8) *Tuliparamba.*—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.

GLOSSARY.

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