

020000

K
J. 211 Y N 37
N 38; 2

(23)

R.O.C. No. D. 68-PdL./38.

OFFICE OF THE DIRECTOR OF AGRICULTURE,
MADRAS, dated the 4th August 1938.

From

P. H. RAMA REDDI, Esq., I.A.S.,

Director of Agriculture,

Madras.

To

THE SECRETARY TO GOVERNMENT,

DEVELOPMENT DEPARTMENT,

Fort St. George, Madras.

SIR,

[Administration Report—Agricultural Department—1937-38.]

I have the honour to submit the following report on the operations of the department for the year 1937-38.

I.—ADMINISTRATION.

2. Diwan Bahadur D. Ananda Rao was in charge of the department till 15th September 1937, when he went on leave till 20th December 1937, preparatory to retirement. I took charge of the department on 16th September 1937 and continued to hold it for the rest of the year.

3. Sri Ananda Rao attended the Indian Central Cotton Committee meeting at Bombay in August 1937 and I attended the meetings of the Advisory Board of the Imperial Council of Agricultural Research at New Delhi twice, the Indian Central Cotton Committee meeting at Bombay and the meeting of the Crops and Soils wing of the Board of Agriculture at Lahore.

Orders of Government were received towards the end of March 1938 on the re-organisation of the department, reducing the number of Deputy Directors in charge of circles from 8 to 4 and increasing the number of Assistant Directors of Agriculture from 10 to 13. These changes could not be given effect to before the close of the year under report.

Towards the end of the year under report, orders were issued by Government directing the transfer of the Livestock Section to the Veterinary Department with effect from 1st April 1938.

Leave, transfer, appointment, confirmation, etc.

4. *Indian Agricultural Service.*—Mr. R. W. Littlewood, Deputy Director of Agriculture, Livestock, went on leave out of India for

one year from 15th September 1937. Rao Bahadur G. N. Rangaswami Ayyangar was on four months' leave from 29th June 1937 and Mr. Saadat-ul-lah Khan, Deputy Director of Agriculture, IV Circle, St. Thomas Mount, on one month's leave in March 1938.

Madras Agricultural Service.—As in the last year, there were several changes in the Madras Agricultural Service. Sri T. Budhavidheya Rao Nayudu, who was Deputy Director of Agriculture, II Circle, till 3rd August 1937 was transferred to VI Circle, Madura, as Deputy Director. He joined duty at Madura on 15th November 1937 after availing himself of leave for three months. Sri Y. G. Krishna Rao Nayudu, Deputy Director of Agriculture, VIII Circle, Coimbatore, was transferred to Guntur as Deputy Director and his place at Coimbatore was taken by Sri C. Ramaswami Nayudu, Deputy Director of Agriculture, Madura. During the absence of Sri T. Budhavidheya Rao Nayudu on leave, Sri R. N. K. Sundaram, Assistant Director of Agriculture, Cuddalore, was appointed as Deputy Director, Madura, his place at Cuddalore being taken by Sri K. Raghava Acharya, Lecturer in Agriculture. Sri S. Narayana Ayya, Assistant Director of Agriculture, Tinnevely, was transferred to Coimbatore as Superintendent, Central Farm, in relief of Sri M. U. Vellodi, who succeeded Sri K. Raghava Acharya as Lecturer in Agriculture. Sri A. Gopalan Nayar, Upper Subordinate, Agricultural Section, was posted as Assistant Director of Agriculture, Tinnevely, in July 1937 in place of Sri S. Narayana Ayya.

Rao Bahadur N. S. Kulandaiswami Pillai, Deputy Director of Agriculture, V Circle, Trichinopoly, retired from service on 9th November 1937 and he was succeeded by Sri R. N. K. Sundaram.

Sri T. Murari, Superintendent, Livestock Research Station, Hosur, was appointed as Deputy Director of Agriculture, Livestock, during the absence of Mr. Littlewood on leave and Sri A. Gopalakrishnayya, Assistant Director of Agriculture, Nellore, was transferred as Superintendent, Hosur. Sri V. T. Subbiah Mudaliyar, Assistant Director of Agriculture, Madura, was transferred to Nellore in place of Sri Gopalakrishnayya and Sri E. Kunhappa Nambiyar, Farm Manager, Taliparamba, was promoted as Assistant Director and posted to Madura. Sri K. T. Bhandary, Assistant Director, Salem, died on 12th February 1938. Sri V. T. Subbiah Mudaliyar was transferred from Nellore to Salem and Sri Narayana Ayya from Central Farm to Nellore. Sri V. G. Dhanakoti Raju, Agricultural Demonstrator, was promoted to the Madras Agricultural Service and posted as Superintendent, Central Farm, in place of Sri Narayana Ayya. Sri G. Jogi Raju, Assistant Director of Agriculture, Vizagapatam, was granted leave for nine months from 3rd January 1938 and Sri V. N. Subbanna Acharya, Agricultural Demonstrator, was appointed to this vacancy.

During the absence of Rao Bahadur G. N. Rangaswami Ayyangar on leave, Sri C. Vijayaraghava Acharya, Superintendent, Dry Farming Station, Hagari, acted as Millets Specialist and Pandit Krishna Rao, Assistant in Millets Section, was posted as Superintendent, Hagari.

Sri K. Avudainayakam Pillai, Business Manager, who continued to work under the Tiruppur Co-operative Trading Society in the Co. 2 Seed Multiplication Scheme, financed by the Indian Central Cotton Committee, reverted to the department on the conclusion of the scheme on 17th June 1937 and he was posted to Vellore as Assistant Director of Agriculture in relief of Sri A. Chinnathambi Pillai who was posted to Coimbatore to take up the post of special Assistant Director of Agriculture sanctioned for Lower Bhavani Project.

Messrs. M. Suryanarayana, Assistant Agricultural Chemist, Cholam Malting Scheme, and Paul D. Karunakar, Agricultural Bacteriologist, were granted leave, the former for six months and the latter for about three months and during the absence of these two officers, Sri P. V. Ramaiah, Government Agricultural Chemist, carried on their work in addition to his own.

Sri K. Gopalakrishna Raju, Provincial Marketing Officer, was on leave for about two months in July-August, when Sri K. W. Chakrapani Marar, Assistant Marketing Officer, was in additional charge.

Mr. N. G. Charley, Research Engineer, was away on leave for about five months from May to October, when Sri B. N. Lakshmi-pathi Mudaliyar, Estate Mechanical Engineer, held additional charge of the section.

The temporary post of Assistant Marketing Officer to assist in the development work connected with marketing, which was sanctioned till 4th January 1938 was continued for a further term of one year. The temporary post of Assistant Agricultural Chemist sanctioned to carry out a soil survey on an intensive scale in the Tungabhadra Project area was filled by Sri C. V. Ramaswami Ayyar. The Rice Research Station, Berhampur, having been transferred to the Orissa Province with effect from 1st April 1937, Sri Samuel Jobitha Raj, Superintendent of the Farm, was posted to the Agricultural Research Station, Pattambi, reverting Sri S. Dharmalinga Mudaliyar.

The continuance of the temporary post of Superintendent, Dry Farming Station, was sanctioned during the year.

Madras Agricultural Subordinate Service.—There was no increase in the cadre of Upper Subordinates during the year.

In August 1936, Government sanctioned 40 additional posts of Upper Subordinates for filling up several gaps in Telugu districts. To fill up these vacancies, 35 candidates were recruited

and all of them were appointed in May 1937. The majority of them have had training in agricultural stations and district work and are now fit for being put in charge of district work.

II.—AGRICULTURAL EDUCATION.

5. *Agricultural College, Coimbatore.*—One hundred and eighty-four applications were received for admission as against 156 in 1936-37, and 116 in 1935-36. Of this number, 130 candidates appeared for interview before the Selection Committee at the two centres, Bezwada and Coimbatore, and 42 of them were selected and 13 were placed in the waiting list. Only 37 of the selected candidates joined the College and seven were admitted from the waiting list. Four failed students were re-admitted. The final strength of class I stood at 48.

Scholarships.—Of the five scholarships, two were given to Muhammadans and three to backward classes. The scholarship awarded to a student of the backward class during 1936-37 having fallen vacant on account of his failure to qualify for promotion to the second year class, it was reallotted to a scheduled class student of class III.

The Arcot Rajagopal Mudaliyar Vellala Students' Scholarship was awarded this year to a student of class I.

Examinations.—The number of candidates that appeared for the B.Sc.Ag. examination in 1937 and passed is as follows:—

	Number appeared.	Number passed.	
First examination	45	37	
Second examination	37	29	plus 7 who failed in one subject only and are eligible for attending B.Sc. Ag class III.
Final examination	25	20	5 candidates were referred in one subject.

Ten candidates referred from the second examination in 1937 appeared this year. Seven of them passed and the remaining three were referred again in Agricultural Engineering. All the seven candidates referred from the final examination in 1937 appeared and passed.

Lectures and tours.—Eleven special lectures were given to students by various research officers. Besides the weekly short trips to adjoining villages, the students of class III and class I were, as usual, taken on long tours during October 1937 and January 1938 respectively.

6. *Agricultural Middle Schools.*—The school at Usilampatt continued to function this year. It was decided by Government to close the school from the end of this school year and to amalgamate it with the local High school.

7. *Farm Labourer's Schools.*—The three schools at Anaka palle, Palur and Coimbatore, continued to function. At Anaka palle, there were 24 boys on the rolls during the year as against

25 of last year. At Palur, there were 34 on the rolls as against 31 in the previous year. At Coimbatore, there was only one boy in the school with wages and 19 boys without wages as against 3 and 24 respectively during the previous year; steps have since been taken to admit more boys with wages in this school.

8. *Short courses in Practical Agriculture.*—The following short courses were conducted during the year at the Agricultural College, Coimbatore:—

Course.	Number of students admitted.
1 Farm management	14
2 Horticulture	2
3 Insect pests and diseases	3
4 Diaring and malt making	4
5 Care of animals	2
6 Bee-keeping	2
7 Jaggery making	2
8 Farm implements, manuring and crop improvement.	2

The students attending "Farm management" course had their training along with other students in special courses of items 2 to 8.

The short courses in Agriculture that were started last year at the Agricultural Research Stations at Nandyal and Taliparamba were continued this year also. The course lasted for nine months. At Nandyal, 19 applications were received; six of them were selected but only three completed the course. At Taliparamba, five students were admitted but only three completed the course.

A short course in fruit culture and nursery practices was instituted at the Fruit Research Station, Kodur, for a period of six months. Seventeen applications were received of whom seven underwent the course for six months, three for four months, one for three months and two for two months. In addition, two agricultural subordinates and one demonstration maistry underwent training at the station.

A short course of practical training in Agriculture was given, as in the previous year, to the educated unemployed young men for a period of four months at several agricultural stations in the Presidency. During the period of training, the students were given a stipend of Rs. 15 each per mensem. Of the 60 candidates that were selected for admission, 34 completed the course and the remaining 26 did not either join the course or left it after joining.

9. *Dairy.*—The dairy herd consisted on an average 27.9 cows during the year, as against 28.8 in the previous year. 20.6 of them were in milk and 7.3 dry against 21.6 and 7.2 respectively

in the previous year. The percentage of cows in milk to the number in the herd during the year fell to 73.8 from 75 in the previous year.

The total quantity of milk handled during the year was 110,909 lb. which included 4,234 lb. purchased from outside to meet the demand when the Dairy supply failed, while, the quantity handled in the previous year was 115,061 lb. The milk was disposed of as follows:—

	1937-38.	1936-37.
	LB.	LB.
Sold	83,840	80,467
Fed to calves	8,123	10,237
Separated	17,667	22,909
Colostrum for exhibition, demonstration, etc.	1,279	1,448
Total ..	110,909	115,061

Out of 17,667 lb. of milk that was separated, 1,806 lb. of cream was obtained and 1,774 lb. of this cream was converted into butter and the quantity of butter obtained was 996 lb.; 937 lb. were sold as butter and 20 lb. were converted into ghee. In the previous year, 1,269 lb. of butter were obtained from 2,210 lb. of cream; 829 lb. of butter were sold and 381 lb. converted into ghee. The increase in the sales of butter during the year under report was apparently due to the reduction in the price of butter from January 1936. The reduction in price minimized the quantity of butter converted into ghee.

The receipts by the sale of eggs and poultry amounted to Rs. 1,063 against Rs. 589 in the previous year.

The total receipts from the dairy during the year amounted to Rs. 11,335 and the expenditure to Rs. 11,545 as against Rs. 11,081 and Rs. 10,889 respectively in the previous year. Thus the working of the dairy discloses a net loss of Rs. 210 during the year as against a profit of Rs. 192 in the previous year. This was due to the inclusion in the accounts for the first time the interest on mean capital which amounted to Rs. 806.

10. *College Day and Conference.*—The twenty-sixth College Day and Conference was held on 22nd and 23rd July 1937 under the presidency of Diwan Bahadur S. E. Ranganatham, Vice-Chancellor of Madras University. The Conference was attended by the Director of Public Instruction, Madras, the District Educational Officer, Coimbatore, and a few members of the Madras Legislative Assembly besides the usual members and staff of the department and the members of the Madras Agricultural Students' Union.

The College Day sports were held on 24th July 1937 when Mrs. A. C. Woodhouse kindly gave away the prizes to the winners. In co-operation with heads of sections in the Research Institute,

a comprehensive exhibition of the important lines of work of research pursued by them was held during the days of the Conference.

III. SEASON.

11. The south-west monsoon advanced as a feeble current on the Malabar Coast on 4th and 5th June, strengthened and established itself there in the second week of the month. Unlike the previous year, the monsoon broke out late during the year. Although the rainfall was heavy in June on the West Coast, it was less than normal in other parts of the Presidency. The monsoon was active in July on the West Coast and the Deccan. The rainfall in this month was bordering on or above normal except in South Arcot, the Central districts and the south (Tinnevely excepted). In August, the monsoon weakened and the rainfall was below normal except in parts of Circars, the Central districts and the South. Towards the end of September, there were heavy falls at a few stations but the rainfall in this month was generally below the normal except in Trichinopoly, the south (Tanjore excepted) and South Kanara.

The south-west monsoon was, on the whole defective except in Chingleput, Chittoor, Trichinopoly, Madura, Ramnad and South Kanara and the sowings of crops were generally below the average.

The north-east monsoon set in over the Bay of Bengal by the middle of the third week of October and became established by 20th of the month. The rainfall during October was generally above normal except in Bellary, Salem, Coimbatore, Ramnad and Tinnevely. The disturbances in the Bay off and on in November kept up the activity of the monsoon. The rainfall in this month was, therefore, fairly widespread in the south-east Madras and extended into the rest of the Presidency, some stations in South Madras recording heavy rain about the middle of the month. The fall was above normal except in the Circars, the Deccan and the West Coast. South Arcot and Chingleput had twice as much as normal in the month, with the result that many tanks breached in these districts and the rivers overflowed their banks damaging some standing crops especially in the South Arcot district. The monsoon weakened in December and except for a precipitation of 6 inches on 10th at Madras, the rainfall during the month was generally below the normal. January 1938 was generally rainless. There were occasional showers in the north Madras coast during the first ten days of February and except for scattered falls in south-east Madras during the last four days, the monsoon in February also was feeble. The north-east monsoon was, on the whole, bordering on or above normal only in Cuddapah, the Carnatic, the Central districts, Tanjore and the West Coast and defective in the Circars, the Deccan (Cuddapah excepted) and the south (Tanjore excepted). The

extent of area cultivated up to December 1937 was generally above the normal but it was a little less than the previous year's area in the case of wet crops.

The effect of the season on the crops at the various Agricultural Research Stations.—The uneven distribution of rainfall during both the monsoons had an adverse effect on paddy at Anakapalle and the Paddy Breeding Stations at Coimbatore, Aduturai and Ambasamudram, on sugarcane and plantains at Samalkota, on groundnut at Tindivanam and Guntur, on pulses and coriander at Koilpatti and on the dry and garden crops at Palur, Central Farm, Coimbatore and Pattukkottai; cotton and jonna gave, however, normal yields at Nandyal. At Ilagari, mungari (early) crops had to be sown late by two months along with hingari (late) cotton. Palur had 30 inches of rain in November and owing to heavy floods on 16th November, the farm was under 2 feet of water for about 12 hours; there was, however, little damage. Nanjanad was the only research station which had an even distribution of rainfall and potatoes and samai fared satisfactorily. Fairly good crops were also obtained on the Millets Breeding Station, Coimbatore, Buchireddipalayam, Gudiyattam and Maruteru. The droughty weather, though it affected the yield of cotton and Bengalgram in the Cotton Breeding Station, Coimbatore, was helpful to some extent in checking the multiplication of the cotton stem weevil (*pempheres affinis*). Owing to deficient rainfall on the Livestock Research Station, Hosur, tanks went dry much earlier than usual and there was water scarcity in addition to inadequate grazing for cattle. At the Fruit Research Station, Kodur, the north-east monsoon was specially favourable and was responsible for producing a good second crop of oranges. The season was a failure for hingari crops in the Bellary district but it provided an opportunity to study the effects of irrigation on the crops raised in the hingari season at the newly opened Agricultural Research Station at Siruguppa in the Tungabhadra Project area.

IV. RESEARCH.

A. Chemistry.

12. The Chemistry Section is the biggest of all research sections of the Agricultural Research Institute, Coimbatore, and covers a wide ground of advisory and research work. Samples of soils, manures, animal food-stuffs and fodders, water for irrigation purposes, human foods from jails and hospitals and other agricultural produce were analysed for the public and Government departments and advice was given on them. Analytical work consisted of the analysis of 2,541 samples in all as against 2,155 in the previous year.

The soil survey of Gundlakamma Project was completed during the year. The results indicate that the soils at the head end of

the command are of high fertility while those near the seashore are saline and almost unfit for cultivation. The soils in general are of alluvial origin. The water of Gundlakamma is of fair quality and not likely to be injurious to crops.

Further investigations into the origin of soils in the Tungabhadra area confirm the previous indications that they were derived from the parent rock below and not from any other source. A study on the effect of irrigation on black soil was started during the year at Siruguppa, Bellary district, with a view to find out the movement of salts in the soil and the quantity of irrigation water required for raising crops successfully under the conditions prevailing in the tract. It is also proposed to study the main dry crops of the locality, viz., cotton and cholam under irrigated conditions and some garden crops. The results so far obtained show a marked increase in the yield of cholam, as a result of irrigation. No such encouraging results have been obtained from cotton.

The effect of sullage water and effluent from the activated sludge plant was once again tested on paddy. Sullage water diluted with three volumes of ordinary water gave an increased yield of 21 per cent in grain and 64 per cent in straw while effluent water gave a 3 per cent increase of grain and 40 per cent increase of straw over what was obtained from the use of ordinary channel water alone.

The residual effect of molasses on paddy was studied again for the second time. No effect was perceptible.

Experiments on animal nutrition have been in progress for some time past with the object of ascertaining the relation between work turned out and the protein requirements of working bullocks. During the year under report, the three groups of experimental bullocks were given work for 4 hours, 6 hours and 8 hours per day respectively and the results noted were (i) that the protein requirement of the bullocks increased with the quantity of work performed, (ii) that the additional quantity of protein required, though not proportional to the increase in quantity of work, was a linear function of the quantity of work, and (iii) that the product of the break down of tissues was excreted in the urine wholly as urea and ammonia. It has also been ascertained that the minimum quantity of digestible protein required by a Kangayam bullock is in the neighbourhood of 100 grams per day.

Further experiments on mineral metabolism of dairy cows confirm the previous conclusion that, while cows during their pregnancy required only a steady supply of calcium and phosphoric acid, their requirements of the two mineral substances sharply increased after parturition and when they began to yield milk.

Forty-six samples of indigenous grasses were analysed for mineral content in connexion with the pasture survey in the

province. The hill grasses were in general poor in mineral content while those of the Kangayam tract were of very good composition. The samples obtained from the hilly regions of the Palnad and Vinukonda taluks of Guntur district showed great variation, ranging from grasses with a high mineral content in the 'Beedu' or private grazing lands on the plains to very deficient grasses in the forest areas.

Kollukattai and Rhode grasses were studied for response to manuring. Cattle manure showed no appreciable effect over the control plots, but the application of ammonium sulphate raised the protein content of both the grasses.

In the Poultry nutrition experiments, the two feeds, fish meal and groundnut cake, gave a differential make up of protein in the egg and flesh, fish meal producing more of the amide fraction.

Preliminary experiments on the sulphur metabolism of sheep have given an indication that the conversion of sulphur into sulphate form in the body of sheep was due to the bacteria in its intestinal tract; the site of storage of sulphur in the sheep is yet to be investigated.

The biological value of the protein of ragi and cholam crops from the old permanent manurial plots and of Panivaragu (*Panicum miliaceum*) and ragi from the new permanent manurial plots was determined. In the old permanent manurial plots, cattle manure gave grains with a higher biological value than "no manure" and mineral manures. No such difference was observed in the new permanent manurial plots. The rice grown with effluent water had a protein content of 10.40 per cent and that with ordinary channel water 7.60 per cent, the net protein value of the two being 8.29 per cent and 6.39 per cent respectively.

On the side of micro-biology, the field scale tests with the sowings of cereal seeds inoculated with *Azotobacter*, a soil organism gave a higher yield of ragi grain and straw. No such results were obtained with wheat.

Studies on the keeping quality of milk indicate that the boiling of milk for five minutes destroys most bacteria, even those of highly contaminated milk and that the multiplication of bacteria on keeping the boiled milk is at a very slow rate for the first three hours and then comparatively rapid, reaching a peak during the sixth to ninth hour. This shows that the South Indian method of boiling milk for keeping is a safe one.

The preliminary work on the nitrogen content of cane juice and its effect on the colour of jaggery has shown that the development of colour during jaggery making, even after filtering, is correlated with the presence of nitrogenous substances in the cane juice. Cane juice with high nitrogen content gives dark coloured jaggery even after filtration through carbon.

The problem of the arrowing of sugarcane was taken up during the year. The results show (i) that there is a tendency for the cane to produce flowers as the carbon: nitrogen ratio of the top of the cane increases, (ii) that the cane begins to dry progressively from the top downwards, and (iii) that the extraction percentage decreases as a result of arrowing while the sucrose content remains constant.

Jaggery, free from the characteristic toddy flavour from palmyra and coconut juice, was obtained by a process employing the removal of lime from the juice by superphosphate and filtration through active carbon.

Work on cholam malt was continued with the financial help of the Imperial Council of Agricultural Research. Further investigations into the keeping quality of cholam malt show that when it is packed in vacuum tins its quality remains unimpaired. Biscuits prepared by blending a fair percentage of cholam malt with white flour are as palatable and nutritious as imported biscuits and better than ordinary bread.

B. Botany.

13. On the systematic side of the section, 870 botanical specimens were identified and the 611 specimens collected from Coimbatore, Cuddapah and Nellore districts were incorporated into the herbarium. The herbarium was originally located at Madras and was subsequently removed to Ootacamund. Later on it was shifted to the Agricultural Research Institute, Coimbatore, where it is now situated and is one of the best of its kind in India.

Under economic botany, over 170 species of grasses were collected from a survey and the most promising of them, a dozen in number, are under trial. This study is very useful to the investigation of the improvement of grazing areas and forage plants in the province. A survey of bananas was made in Nellore district and Coorg and the character study of five local varieties was completed. The four banana varieties, "Apple," "Kaio," "Hai," and "Bluefield" (or the world famous "Gros Michel") of Honolulu (Hawaii) which are under trial are thriving satisfactorily. One of them, 'Apple' has proved to be the Kapur of this province and two, 'Kaio,' and 'Hai' appear to be better than the West Coast Nendram as vegetable varieties. The fourth, 'Bluefield' is now in bunch. Three hundred and sixty two suckers representing various varieties were supplied to several people.

C. Crops.

(1) Cereals.

14. (a) *Millet*s—(i) *Cholam* (*Andropogon sorghum*).—At Coimbatore, there are two principal varieties of irrigated cholam—Chitrai Vellai and Chitrai Manjal—grown for grain in summer season. Of the former, two strains A.S. 732 and A.S. 1543 were

found superior to the farm bulk for the third and first time respectively. Other new strains did not give better yields than A.S. 1575 and A.S. 2095, the two standard strains. In the Chitral Manjal Variety, A.S. 1195 proved better than the standard, A.S. 809, but the size of its grain is too small. In the main season (rainfed) crop, twelve selections of Peria Manjal cholam and seven selections of Talai-Virichan cholam were tested for yield with A.S. 29 and A.S. 1093 respectively as standards. The differences in yield were not significant. In preliminary yield trials, nine other new strains of Talai-Virichan gave better results than A.S. 1093.

At Guntur, ten jonna (cholam) selections were compared in two series with the local variety. In one series, J. 103 and in the second, J. 106 gave the highest yield. A large number of other selections were under observation.

At Hagari, practically all test plots of local selections failed almost completely owing to the failure of the season.

At Nandyal, selection 223 gave the highest yield in comparative tests while selection 224 which gave consistently best yields during the previous three years fell short. Three other new selections Nos. 628, 294 and 653 appear promising.

In the absence of good grazing anywhere in the province except in a few localities, the importance of the improvement of straw along with the improvement of grain cannot be overlooked. Of the several strains of fodder cholam varieties tested during the year, A.S. 3355 has proved to be the best in every respect and will be given field scale trials at Coimbatore and Erode. A cross between peria manjal cholam of Coimbatore and yerra jonna of Bellary has given very high yield of fodder. It has, however, the defect of lodging due to its tall growth and heaviness, being juicy. It has been back-crossed with the peria manjal parent with a view to make suitable selections.

Cholam plant suffers from the attack of striga, a flowering parasite which attaches itself to the roots of cholam plants and depletes their sustenance. All local varieties of cholam are susceptible to the attack and of the imported varieties, one from Tanganyika and another from the Bombay Presidency have been observed to be practically free from attack. These two varieties have been crossed with a local variety with a view to securing a resistant type.

Studies were continued on the habit of flowering, chlorophyll deficiencies in seedlings, colour on glumes and the relation between juiciness and colour in the mechanical tissue of cholam stalk.

(ii) *Ragi*—(*Eleusine coracana*).—In field trials under irrigated conditions at Erode, E.C. 593 and E.C. 3735 gave 21 and 33 per cent more yield respectively than local ragi. E.C. 593 continues to be popular in many irrigated tracts in spite of its longer

duration, owing to its heavy yielding quality. It has also proved to be suitable as a rainfed crop and is likely to take soon the place of H. 22 of Mysore in Salem district. E.C. 3735 is a short duration strain and bids fair to replace E.C. 593 in localities where long duration is a handicap.

At Anakapalle, where ragi is grown as an irrigated crop in both pyru (January-April) and punasa (April-June) seasons, V.Z.M. 33 and E.C. 593 in the pyru season and B.A.M. 10 in the punasa season gave the highest yields in comparative tests. As a rainfed crop E.C. 593 gave the best yield.

At Hagari, R. 42 proved its superiority in yield of both grain and straw over all other strains compared with. It has all the good qualities of E.C. 593 with incurved panicles which might satisfy the fancy of the local cultivators.

(iii) *Cumbu*—(*Pennisetum typhoideum*).—In the yield tests of irrigated strains, P.T. 700 fared better than P.T. 499 (Punjab type) while no difference was noticed between P.T. 2229 (Kottapali cumbu) and P.T. 2125 (Vellai cumbu). Of the rainfed types, P.T. 367, a selection from a Bombay variety, gave better yield than P.T. 248 (Kattu cumbu) for the second time. P.T. 2229, P.T. 499 and P.T. 700 have been selected for further tests in Coimbatore, Trichinopoly, North Arcot and Chittoor districts under ordinary cultivators' conditions.

(iv) *Korra*—(*Setaria Italica*).—At Coimbatore, S.I. 523, a selection from a rainfed variety, proved once again its superiority over all other rainfed types. Four new strains of irrigated variety yielded better than S.I. 544, the best of the present irrigated strains. S.I. 523 and S.I. 544 are being tested in districts under local conditions.

At Hagari, the trial plots failed completely owing to the failure of the season.

(v) *Panivaragu*—(*Panicum miliaceum*).—P.V. 36 gave 14 per cent increase of grain over P.V. 31 at Coimbatore. The grain of the two strains yielded 74 per cent and 70 per cent rice respectively.

(2) Paddy.

The season was favourable at all paddy breeding stations except at Coimbatore where the crop suffered for want of timely rains.

(i) *Pure line selection*.—At Coimbatore, a selection from Sendinayagam of Tinnevely district, referred to in last year's report was, after exhaustive trials, released for distribution to the cultivator under the name of Co. 2.

Two other selections from Pedha attragada and Delhi bhogam were similarly issued from Maruteru under the names of Mtu. 12 and Mtu. 13.

Two new strains from Pattambi, Ptb. 3 and Ptb. 4 were for the first time under district trials in South Kanara and their performance was quite satisfactory.

At Aduturai, Vellai Kuruvai No. 5715 gave again this year 13 per cent increase over the bulk, the average increase for the three years it was tested working out at 12.5 per cent. It will be tested next year in districts. Sarapalli No. 5971 again showed its superiority over all the strains of this variety. The five promising selections of aruvattam kuruvai were again tested for the third time and the best of them, No. 5647 will be sent out for district trials next year. Kuruvai No. 5905 gave 27.8 per cent higher yield than standard at the Research Station and proved quite satisfactory in district trials in Tanjore district. It will be released to the cultivator in the next season as Adt. 16. Selection No. 4871 from thattan samba and 4677 from Molagolukulu will also be sent out for district trials.

Over 1,500 cultures isolated from many important varieties of paddy in the presidency were also under different stages of trials at all paddy breeding stations.

(ii) *Hybridization*.—The simple method of single plant selection has its limitations while hybridization offers a wide scope for crop improvement by combining the good qualities, such as, yield vigour, resistance to diseases, etc., of two or more parents in their offspring. Two hybrid strains, between Co. 3 and a Burma variety, with the qualities of high yield and stiff straw gave promising results wherever water-supply was adequate and also withstood submersion. Three other hybrid strains, resistant to paddy blast, not only withstood severe tests for disease resistance but gave also high yields. One of them did well in alkaline soils where no good crop was obtained in previous years. A cross, No. 7306, between Adt. 20 and Adt. 3 gave 15 per cent increase over Adt. 3 used as standard. It is of 90 days' duration with white sirumani type of grain suitable for growing in the kuruvai season. There were also 600 other strains from a number of crosses under various stages of study at all paddy breeding stations.

(iii) Studies of the inheritance of characters like glume colour, *asynapsis* and season and period bound habits of rice were continued. The purple colour of the glume in one case is due to the interaction of two complementary factors. *Asynapsis* in rice is a mendelian character controlled by duplicate genes. In the cytological study, a sterile mutant has proved to be a tetraploid.

Enquiry into the nature of inheritance of the ageotropic mutant obtained last year from X-rayed seed material was pursued. Of the six promising cultures from X-rayed G.E.B. 24, four dwarf mutant strains lodged much earlier than G.E.B. 24 under the influence of high manuring while the remaining two strains gave significantly higher yields than G.E.B. 24. A somatic mutant with higher vigour and early maturity has been

spotted out and if the two qualities can be permanently fixed the mutation bids fair to be of great economic value.

(iv) Polishing trials with red and white rice show that mill-polished rice loses about 12 per cent of the bran layer and is therefore poor in value of diet. Unpolished rice on the other hand does not cook uniformly. Hand-pound rice loses 2—3 per cent bran but due to the irregular removal of bran its cooking quality is not quite satisfactory. A uniform removal of the same percentage of bran by an improvised polisher at Coimbatore gave the best cooking value. Rice requires slight but uniform polishing for best nutritive and cooking values.

(v) *Agronomy*—(a) *Cultural Trials*.—At Coimbatore, in the dibbling and transplanting experiment, dibbling in dry has given higher yield than transplanting.

At Pattambi, broadcasting early in the first-crop season again proved more profitable than broadcasting late after the commencement of monsoon when transplanting yields better than broadcasting. Seedlings up to 60 days old had again this year no bad effect on the yield so long as the time of planting was normal but where planting was delayed, 30 days old seedlings gave better results.

In spacing experiments at different Agricultural Research Stations, close planting has given better yields. The extra yield is not, however, enough to cover the additional cost of very close planting. Higher yield was also obtained by increasing the number of seedlings per hole with wider spacing.

In the experiment to ascertain the effect of paddy seed graded by means of concentrated brine, no advantage was gained by grading the seed into heavy and light though in a short duration variety heavy seed seems to give better results. There seems to be also no particular advantage in processing the seed paddy more than the normal method of cleaning.

(b) *Manurial trials*.—At Coimbatore, superphosphate was again ineffective when applied to seed bed. It was effective to the planted crop only when applied at the time of planting. Sulphate of ammonia at 30 lb. nitrogen per acre gave better yield than groundnut or castor cake at the same rate of nitrogen. The optimum time of application of the three manures was six weeks after planting but when they were applied at planting, the oil cake responded better than sulphate of ammonia. Successive increase in the dose of nitrogen in any form of green leaf contributes to progressive increase in yield though wild indigo for the same quantity of nitrogen gave better response than daincha or *Sesbani species*.

At Pattambi, groundnut or castor cake or green leaf manure at the rate of 30 lb. nitrogen per acre gave an increase of 25.3 per cent over no manure. When in addition sulphate of ammonia was applied as top dressing, the increase over no manure went up

to 40-60 per cent. Neem cake gave comparatively lower yield than the other two cakes.

At Maruteru, green dressings at 4,000 lb. per acre were more beneficial than at 2,000 lb. Over a basal dressing of green leaf at 4,000 lb., the optimum economic dose of nitrogen and phosphoric acid was 32 lb. each per acre. No difference was noticed when phosphate was applied with groundnut cake either in the form of flour phosphate or milled guano.

At Aduturai, bone meal in any quantity did not enhance the yield over that obtained by leaf alone indicating thereby that the soils of this station are well supplied with phosphoric acid. Molasses at 2 and 4 tons per acre gave significantly higher yield than no manure, but it had very little residual effect on the succeeding crop when applied at 2 tons per acre. It had some effect when applied at 4 tons per acre.

At Anakapalle, the optimum dose of green leaf appears to be 6,000 lb. per acre. Bone meal or superphosphate in small quantities in addition to green leaf had no effect.

(vii) *Irrigation experiments*.—At Coimbatore, the results obtained this year gave an indication that large supply of water at wide intervals between irrigations would give higher yield. The experiment will be repeated.

(3) Fibres (Cotton).

15. (a) The season was not favourable for research work on cotton at Coimbatore and Hagari owing to insufficient and irregular rainfall. It was favourable at Nandyal, Guntur and Koilpatti.

The last year's arrangement for growing two generations of cultures in a year instead of one, one from March to September at Srivilliputtur in Ramnad district and another from September to March at Coimbatore, was continued again this year.

(i) *Pure line selection*.—Co. 2 the most popular strain in cambodia suffers from late maturity, susceptibility to cotton stem weevil and coarseness of fibres. Two of the subsequent cambodia strains, 920 and 1267 have given better results than Co. 2; strain 920 is expected to replace Co. 2 soon. Further improvement in cambodia does not appear to be possible by pure line selection and greater attention is therefore being paid to hybridization.

At Koilpatti, K. 1 proved once again its superiority over all other strains in yield tests. A large number of pure line and hybrid selections were under trial.

Of the seven strains compared at Guntur, X-20 and X-12 gave significantly higher yields than local mixture.

At Hagari, none of the strains tested were again found superior to H. 1, showing thereby that the chances of obtaining by pure line selection new strains better than H. 1 are remote. Any further improvement is possible only by cross-breeding.

At Nandyal, 2108/8 gave again this year higher yield than N. 14 but it has the same low ginning percentage as the latter.

(ii) *Hybridization*.—Simple crossing between species having proved disappointing, resort had to be taken to complex hybridization combined with back crossing to Co. 2. Quality cottons like Sea Island, Sakel, Ashmouni, Maarad and Uganda were used as parents and the examination of their direct and back cross progenies with Co. 2 indicate that combinations of Uganda and Sakel with Co. 2 might prove useful for Coimbatore conditions. The Uganda crosses are superior to Co. 2 and 920 in early maturity, fibre quality and ginning percentage but appear to be more sensitive to seasonal changes, particularly under cold weather conditions. They excelled Co. 2 at Srivilliputtur when sown in summer months.

At Adoni, one of the Uganda crosses, 4383, gave as good yield as local Mungari under identical conditions while at Anakapalle it proved superior to the local mixture.

At Hagari, the cross between 1027 A.L.F. and H. 1 was back-crossed with H. 1 for the second and third time. Promising single plants will be selected from their progenies.

(iii) *Agronomy*.—Comparative tests for yield of cotton when it was sown with seed of first flush and summer flush cotton gave no indication of any difference.

Observations on water requirements of cambodia indicated once again that the demand for water was the highest during the flowering phase and that up to that period it was necessary to maintain a fairly high level of moisture in the soil from the beginning of crop growth. Irrigation in the mornings was more beneficial than at any other time of the day.

(iv) *Fundamental studies*.—Mention was made in last year's report that from the distribution of vascular bundles in the floral receptacle it was possible to distinguish the wild from the cultivated cottons and to divide the latter into five different species. Further investigations revealed that the type of vascular anatomy as found in *arborium* was dominant over those in *herbaceum* and that *barbadense* types and wild cottons were likewise dominant over *hirsutum* and the cultivated varieties respectively. The first generation crosses between Asiatic and American cottons were intermediate in behaviour.

The origin of fuzz and lint was studied. The results indicate that the sub-epidermal region beneath the stomata is the origin of the fuzz hairs and that the cells of this region undergo nuclear changes different from those associated with lint hairs. Lintlessness seems to be due either to the disintegration of the epidermal cells or to the gradual separation of the epidermal layer from the sub-epidermis or to the inability of the cells to protrude. It was also observed that the production of lint was influenced by more than one pair of complimentary factors.

Schemes financed by the Indian Central Cotton Committee, Bombay.—Of the four schemes mentioned in the last report, viz., the Madras herbaceum scheme, the pempheres and physiological scheme, the nadam breeding scheme and the fodder cholam scheme, the lastnamed was closed down during the year at Koilpatti and in its place a new mungari cotton breeding scheme was inaugurated at Adoni.

(i) *Madras Herbaceum Scheme.*—The original object of securing by single plant selection a suitable strain from uppam (herbaceum) equal to karunganni in lint qualities having proved futile, improvement by hybridization was resorted to. As a result of crossing uppam (herbaceum) with other varieties, a large amount of useful material has been obtained. Of this material, strain 4714 has proved again this year quite promising except that its lint is a little coarser than K. 1 (karunganni). Two other strains gave with restricted water-supply nearly as good yield as cambodia indicating that they could be grown with advantage in areas where water-supply is inadequate for cambodia. Over 200 other cultures were under yield tests.

(ii) *Pempheres and Physiological Scheme.*—The chief aim of this scheme is to devise measures for the control of the stem weevil (*Pempheres affinis*) which burrows into the cotton stem, often causing the mortality of plants and to evolve a strain of karunganni cotton which would be least affected by the February rains in the "Tinnies" area.

On the botanical side, a few promising strains have been obtained from crosses between Co. 2 and three South American varieties, Moco, Vardao and Quebradinho, which produce gum rapidly in the hole made by the borer and kill the insect in the stem. The rapid formation of gum is due to larger proportions of polysaccharide present in the plant. A few selections have also been obtained from karunganni cotton which are resistant to shedding and one of them gave 19 per cent more yield than K. 1 the standard cotton of the locality.

On the entomological side, it has been ascertained that temperature above 106° F. was fatal to the insect while beyond 100° F. its eggs did not hatch. Similarly, below 40 per cent of relative humidity, the growth of the insect was arrested. The insect is most active at temperature between 85° and 95° F. and 60 to 80 per cent of humidity.

(iii) *Nadam breeding scheme.*—The main purpose of this scheme is to obtain one or more annual strains of cotton to replace the perennial nadam in parts of Coimbatore, Salem and Trichinopoly districts. The season was once again very disappointing and the plants in single row tests were so badly affected by drought that not more than one boll was obtained per plant. The second and third year crop of local nadam gave, however, a normal yield which shows the advantages of the stand-over crop in such seasons. In comparative tests one of the Uganda crosses, strain 4383,

gave the highest yield of 120 lb. of seed cotton per acre against 71 lb. of cambodia.

(iv) *Mungari Cotton Breeding Scheme.*—Mungari (early sown) cotton grown in the red and mixed soils of Bellary, Anantapur and Kurnool districts is a short stapled coarse variety and is often used for mixing with superior Hingari (late sown) cotton. The scheme was started during the year at Adoni with the object of breeding medium stapled strains to replace the inferior mungari.

At Adoni, the season was extremely droughty with consequent failure of practically all rainfed crops but yet four pure strains from Coimbatore, two from Parbhani, two from Nagpur and M. 274 from Hagari, gave as much yield as the local mungari. A large number of single plant selections also gave encouraging results in progeny rows.

(b) *Sunn hemp.*—A small scheme subsidized by the Imperial Council of Agricultural Research for the investigation of sunn hemp was commenced during the year at Samalkota. Ten different varieties of sunn hemp seed were obtained from different parts of the Province and sown for preliminary study of their characters. The three varieties, Nellore, Samalkota and Tenkasi, flowered at the beginning of September when the plants were hardly 3-4 feet tall and the yield of green stalk obtained from them was therefore low. Their fibre was, however, clean and fairly white in colour but contained bits of pith. Tiruthuraipundi and Dummugudem varieties flowered in the middle of September when they had attained 5-6 feet growth and gave the best yield. Their fibre was long, clean and bright in colour without pith. The remaining varieties from Tadepalligudem, Rajahmundry, Vinukonda and Bezvada were slow in growth in early stages and suffered from heavy rains at the close of September when they were not more than 4 feet in height. Their fibre was of dirty colour and inferior quality. The highest yield of green stalk was obtained from any variety when the plants were in full bloom while retting after drying the stalks for three days gave the best yield of fibre. 0.50 per cent potassium permanganate solution mixed with acidified sodium bisulphate was found to bleach the fibre satisfactorily without affecting its strength.

(4) Sugarcane.

16. At Gudiyattam where work on sugarcane is being financed by the Imperial Council of Agricultural Research, varietal experiments were continued with restricted and normal supply of irrigation and manure. Under the restricted conditions, Co. 213 gave the highest yield closely followed by Co. 243. The yield of J. 247 the control was the lowest but it did not differ significantly from that of Co. 281, which gave the maximum yield last year. Under normal conditions, striped mauritius gave the lowest yield while Co. 408 and Co. 419 yielded the highest with little difference between themselves. There was no difference in yield between

P.O.J. 2878 and J. 247. In ratoon experiments, the ratoon crops of Co. 213 and Co. 414 yielded more than the planted crops of the same varieties while the ratoon crop of J. 247 did not give even one-third yield of the planted crop.

At Anakapalle, in the comparative tests of different varieties, Co. 411 gave the highest yield of 53.5 tons per acre. Of the other varieties, viz., Co. 421, Co. 411, Co. 213, Co. 407, Co. 313, P.O.J. 2878, Co. 508, Co. 281 and J. 247, the last named gave the lowest yield of 28.6 tons per acre while the yield of the remaining varieties varied in the above order from 43.7 tons to 29.9 tons per acre. Of the different methods of preserving sugarcane for planting, viz., (i) heap method (top setts covered with trash and kept moist in shade by frequent watering), (ii) the local method of planting fresh top setts, (iii) North-West Frontier method (entire cane put in a pit and covered with earth), and (iv) Kurnool method (top setts planted vertically in a puddled field covered with paddy straw and kept moist), the local method gave the best results while the North-West Frontier method proved to be the worst. Six varieties of canes were tested for their behaviour under water-logged conditions. Of these, Co. 421 gave the highest yield closely followed by Co. 419 when planted both in February and in May; J. 247 gave poor yield when planted in May while it did better when planted in February. The other varieties tested were, Co. 411, P.O.J. 2878 and Co. 313. Experiments on the ripeness of canes suggest that flowering is not an indication of maturity. Under Anakapalle conditions, cane grew to a slight extent even after flowering, and deterioration commenced only two months after flowering. The arrowed cane gave also higher sucrose content than the non-arrowed for over two months from the date of flowering.

At Samalkota, there were two series of comparative tests. In one of them, Co. 419 proved again its superiority with the highest yield of 69 tons per acre as against 43 to 52 tons of J. 247, Co. 356, Co. 402, Co. 403, Co. 408 and Co. 412, while in the second, Co. 417 gave 60 tons per acre as against 32, 41 and 49 tons, respectively, of Co. 314, J. 247 and Co. 421. Under purely rainfed conditions, except for one irrigation at the time of planting, Co. 421 and Co. 213 gave 29.5 and 17.5 tons per acre respectively and matured distinctly earlier than under normal irrigated conditions. Fifteen varieties were under detailed study in respect of germination, tillering, growth, susceptibility to pests and diseases, arrowing, etc. Co. 421 closely followed by Co. 419 gave the highest percentage of germination while purple Mauritius and Co. 425 recorded the lowest. In tillering, Co. 425 was found to be the best while Co. 404 was the poorest. Co. 425 put forth the largest number of arrows and in varieties like Co. 419 only there was hardly any flowering. P.O.J. 2878 was the earliest to mature followed by Co. 421, while Co. 422 recorded the maximum sucrose content with P.O.J. 2878 the next best. The experiment of planting in deep trenches *versus* the local method of shallow planting in beds

were continued once again. The trench-planted plots did not lodge and withstood drought better than bed-planted plots but they had poor germination and growth, besides flowering and maturing earlier and giving slightly lower yield. In manurial tests, 150 lb. nitrogen was found to be an optimum dose under Samalkota conditions.

At Palur, ten varieties were, as in last year, compared with one another for yield in garden lands where Co. 419 closely followed by Co. 413 topped the list for the third time by yielding 55 tons of cane per acre against 23 tons of J. 247. The yield of other varieties varied from 37 tons to 50 tons. In wet lands, where also the same ten varieties were under trial, Co. 421 gave the highest yield of 60 tons per acre beating Co. 419 and Co. 363 by a margin of 3.5 and 8 tons respectively. Co. 421 withstood both drought and water-logging much better than any other variety. The monthly planting trials indicate that the optimum time of planting both the thick and thin canes was February and March. The crop planted after June gave poor yield.

(5) Fruit.

17. Work on fruit research is mainly confined to the Fruit Research Station, Kodur, with the financial help of the Imperial Council of Agricultural Research. Investigation into citrus propagation by budding was continued. The results show once again that the presence of wood in the bud-shield of Chinese orange and acid lime plants produces larger number of buds on *Kichili* root stocks than in the absence of wood and that July and September are the best months for budding under Kodur conditions. Lopping of *Kichili* rootstocks at the time of bud-insertion stimulated an earlier 'bud-break' by over five days in Chinese orange and over 12 days in acid lime but the presence or absence of wood in the bud-shield had little influence on the maturation of bud sprouts on *Kichili*. In the case of rootstocks, *Kichili* gave the largest growth closely followed by jamberi, gajanimma and gabbu-chinee. A larger number of citrus varieties were planted in the variety collection plots for the study of their classification.

Investigations of the best methods of sowing mango stones, shelled and unshelled, were continued and some interesting results have been obtained. The indication obtained last year that July, August and September were the best months for mango-inarching at Kodur was confirmed. Experiments were in progress to devise a suitable method of vegetative propagation of mango rootstocks under different seasonal conditions and with different kinds of ringed cuttings. Preliminary trials have shown that budding of mangoes in open beds offers a good chance of becoming an established nursery practice. A suitable experiment is, therefore, proposed to be started next year to test the relative merits of several methods of budding.

Work on canning of mango pulp, mango slices, fruit salads, pineapple slices, etc., was continued on a small scale and valuable data have been collected on the optimum period of exhaustion and sterilization.

At Coonoor, 59 grafts of various kinds of fruit trees were planted and nearly 700 plants of plum, peach, pear, apple, orange, lemon, grape fruit, etc., were successfully budded, grafted and inarched during the year. The total yield of fruit obtained during the year amounted to 8,072 lb. against 7,964 lb. last year.

At Burliar, 6,021 lb. of fruits were harvested against 4,989 lb. last year. Mangostein, lichi and durain trees gave satisfactory yields.

At Kallar, the total quantity of fruits harvested was 9,640 lb. against 8,709 lb. last year. Orange crop was fairly satisfactory and about 50 per cent of the young mangostein trees began bearing and gave good yield.

At Coimbatore, some of the unhealthy exotic varieties were replaced by 15 budded Malta orange plants and 11 mango grafts.

At Samalkota, 22 varieties of plantain from all over the presidency were studied for their vegetative, bunch and fruit characters. White Chakkarakeli remained to be the best in taste and flavour, while Karpurachakkarakeli excelled all other varieties in yield consistent with the quality of fruit. Thenkunnan and Keli have their characteristic flavour and taste and Nendram is finding favour in Cocanada.

At Taliparamba, the important fruit varieties grown are mangoes, pineapples, cashewnuts and plantains. No improvement was observed in the weight of pineapple fruits when crown suckers of tender fruits were removed. Of the plantain varieties, Chakkarakeli proved unsatisfactory while Nendram and Mauritius varieties were the earliest and most economical.

(6) Root Crops.

18. *Potato*.—Work on this crop is confined only to the Nanjanad Agricultural Research Station on the Nilgiris. The season was favourable for potato and other crops. Three crops of potato were raised as usual. The yields obtained were 572 maunds in the main crop season, 549 maunds in the second crop season and 464 maunds in the third crop season (irrigated) per acre. The same land was not used for more than one crop in the year.

Breeding.—Work on cross-breeding was continued and 419 seedling crosses were obtained. Out of the 73 hybrid cultures tested in row yields in the main crop season, the most promising of them, 19 in number, were split up into two groups and compared in the second crop season with Great Scot as standard. Three of these cultures gave significantly higher yields than the standard.

Agronomy.—In the permanent manurial plots, the beneficial effects of phosphatic manures and lime and the evil effects of the absence of potash and nitrogen were again distinctly noticeable. Mixture of nitrogen and phosphate gave significantly higher yields than either nitrogen or phosphate alone and the crop in non-potash plots had sickly appearance. The relative merits of the potato manure mixtures of Messrs. Parry & Co. and Messrs. Shaw Wallace were again compared with the farm mixture which contains in the proportion of 85 lb. of nitrogen (organic and inorganic), 215 lb. of phosphoric acid (organic and inorganic) and 108 lb. of potash. In both the seasons, the farm mixture gave better yields than the other two manures under identical conditions. The farm mixture contains a large proportion of phosphoric acid and owing to its constant application to the soils of the Nanjanad Agricultural Research Station, they have become somewhat acid. To correct this acidity, the soils have been applied lime at the rate of $1\frac{1}{2}$ tons per acre. An experiment was started with a view to find out whether in view of the application of lime the quantity of phosphatic manure could not be reduced. The results showed that to obtain satisfactory yields full dose of phosphatic manure was necessary even after liming. The yield of second crop potato on the Nanjanad Agricultural Station is roughly two-thirds of the main crop yield even though the quantity of manure applied was the same in both seasons. With a view, therefore, to ascertain whether two-thirds of the normal dose of manure was not enough for the second crop, a separate experiment was started. It was observed from the results that reduction in the quantity of manure would lower the yields.

In irrigation experiments, irrigation in furrows once in two weeks gave better results than irrigation in furrows once a week. In planting experiments, seed tubers weighing 1–2 oz. planted at a distance of 6 inches to 9 inches in rows gave better results than smaller seed planted closer than 6 inches apart and new seed gave better yield than old seed. There was no advantage of planting seed bigger than 1–2 oz. except when it was old.

(7) Oil-seeds.

19. Research work on groundnut, castor, gingelly, coconut and cashewnut was continued with the triple object of higher yield, improved quality and reduction in cost of production.

(a) *Groundnut*.—An intensive study of groundnut was started in January 1931 with the financial help of the Imperial Council of Agricultural Research.

(i) *Pure line selection*.—The strain A.H. 25 continues to be popular and is rapidly replacing the local spreading variety. Selection No. 678 yielded 10 per cent more than A.H. 25 and is superior to the latter in shelling percentage and weight—volume relationship. It also gives a saving of 25 per cent in seed-rate as its kernels are smaller in size. A large number of other selections of the spreading variety were in different stages of tests.

Bunch strains suffer from the defect of weighing one to two ounces less per Madras measure than the local variety. For this reason they have not yet gained much popularity even though they give higher yield by weight per acre.

(ii) *Hybridization*.—Over 300 hybrid selections were studied. Eight new crosses were also effected between the bunch and spreading varieties with a view to evolve high yielding bunch types with short duration, high oil content and dormancy of seed; the pods of bunch varieties germinate in the field if the rains are received after the ripening of the pods and unless this defect is removed, the cultivator will have a tendency to harvest immature crop which is paid low for its inferior quality.

(iii) *Root studies*.—The spreading varieties in general have better developed root system than the bunch varieties. The improved strain A.H. 25 has better system of roots than the local spreading varieties. The best developed roots will be seen in *Arachis Nambyquarae* and the hybrid from *Gigantea*.

(iv) *Developmental studies*.—The maximum rate of plant growth takes place during the first fortnight after the first flowering in the spreading varieties and during the second fortnight in the bunch types. Most of the flower production takes place during the fortnight immediately following the commencement of flowering in the bunch varieties and during the third and fourth fortnights in the spreading varieties. A.H. 25 gave the maximum percentage of fertilization while the indigenous variety was the poorest in this respect.

(v) *Manurial experiments*.—The groundnut plant did not respond to nitrogenous manures. Potassium sulphate at 1 cwt. per acre and superphosphate at 2 cwt. increased yields but they did not respond in the presence of even a small dose of ammonium sulphate.

(b) *Castor*.—The hybrid selection No. 59-2-1-1 yielded about 30 per cent more than the local variety. Two other hybrid selections appear promising. The three selections are also early maturing by at least a month. Fourteen other hybrid selections and 5 single plant selections were also under final yield tests.

Six horticultural types with attractive heads have also been isolated from crosses.

(c) *Gingelly*.—Mass selections of eight promising varieties were tested for yield and none of them proved superior to the rest. One of these selections S.I. 84 contained 53.83 per cent oil, i.e., about 4-6 per cent more than in most of the local varieties. Thirty single plant selections were carried forward.

(d) *Coconut*—(i) *Breeding*.—Studies of seedlings raised from the nuts obtained by self, cross and natural pollination were continued. 'Crosses' and 'Naturals' were found superior to the 'Selfs' in respect of height and girth of seedlings and number

of leaves but the 'Crosses' were much more vigorous than the 'Naturals.'

(ii) *Selection of seeds and seedlings*.—No difference was observed either in germination or in the production of leaves when seedlings were raised from seed coconuts collected from young, middle-aged and old trees.

Girth and height play an important part in the selection of seedlings but the girth is the more important of the two.

(iii) *Manurial*.—Of the various manures tried during the past six years, ammonium sulphate at 3 lb. and ash at 20 lb. per tree per annum gave the best results. Cattle manure at 100 lb. per tree, ash 20 lb. per tree and fresh fish 40 lb. plus ash 20 lb. per tree per annum did not give satisfactory results. The difference between broadcasting and trenching the manure was negligible from the point of yield and the broadcast application is therefore to be preferred on the grounds of economy.

(e) *Cashewnut*.—The germination of cashewnut starts on the fifth day and extends up to 12-15 days. Big sized and heavy nuts which sink in water give the maximum percentage of germination. The yellow 'fruits' keep better than the red 'fruits' which dry up more quickly.

(8) Spices, condiments and narcotics.

20. *Chillies*.—At Guntur, 120 fresh selections were made for their colour, yield and other economic characters. The promising 26 selections of the last year were tested this year and the best six of them will be further tested next year. In comparative trials, strains Nos. 390, 428 and 455 were found more satisfactory than all other strains tested.

At Taliparamba, the South Kanara variety gave significantly higher yield than the South Malabar variety and Pusa T. 8.

Pepper.—The manurial experiment which was started in 1928 was repeated again this year. The results confirmed once again the previous conclusion that the application of lime and nitrogen and phosphates would increase the yield.

Ginger.—Comparative tests indicate that Trinidad Canton is better yielder than Ernad ginger and Bengal ginger.

Tobacco.—The comparative trials of both cigar and cigarette types were again continued. In cigar types, No. 20 maintained its superiority over all other strains. In cigarette types, Adcock 13 closely followed by Adcock 14 gave significantly higher yield than Harrison Special, Harrison Special 8 and Harrison Special 9. A cross between the local and an exotic type has proved to be superior to all other strains both in yield and quality and it will be issued for general cultivation. Green manuring had depressing effect on the yield of tobacco.

(9) Miscellaneous crops.

21. *Bengalgram* (*Cicer arietinum*).—Two hundred and twenty-four cultures were tested in progeny rows and forty of them have been selected for further testing. In comparative tests the standard strain No. 468 proved again its superiority over all other strains. Nos. 468 and 482 were found significantly better yielders than the local in district trial plots arranged in Coimbatore taluk.

Redgram (*Cajanus indicus*).—Three hundred and twenty cultures were studied in progeny rows and 44 of them have been selected for further tests. Yield trials did not give conclusive results owing to high mortality of plants in them. No difference in yield was observed between the thinned and unthinned plots.

Cowpea (*Vigna catieng, Malp*).—A large number of strains were tested for foliage, for grain and for vegetable. Four types, C. 37, C. 42, C. 422 and C. 512 gave heavy yield of foliage and appear to be fit for fodder and green manure. Four other types, C. 20, C. 92, C. 100 and C. 521 gave satisfactory yields of grain, while only one strain, C. 419 gave good yield of green pods. All these will be further tested.

Lablab (*Dolichos lablab*).—Two buff seeded strains, D.L. 809 and D.L. 231 were tested for yield. The latter gave 17 per cent more yield than the former.

D. Horticulture.

22. Horticultural work was, as usual, confined to the Botanic Gardens at Ootacamund and the Sim's Park at Coonoor and the two gardens were maintained in good condition. At Ootacamund, cross-breeding of different species of lilies did not prove a success. The hybrid primulas flowered satisfactorily and their flowers were bigger than those of their parents. A few hybrid phyllocactus also commenced flowering and the colour of the flowers varied from white to deep pink. The cultivation of medicinal plants like *Ipomoea purga* (Jalap), *Lobelia inflata* (Indian tobacco) and *Barosma betulina* (Buchu) was continued. Edible lupin varieties, including two from Russia, grew satisfactorily and their seeds have been collected for propagation.

At Sim's park, Coonoor, over two dozen new varieties, including *Creodoxa regia* (Royal palm), *Ravenala madagascariensis* (travelers' tree) and *Michelia champaca* red were under trial. The nine surviving tung oil plants (*Aleurites fordii*) did not make much progress. One of them flowered but did not set seeds.

E. Plant Pathology.

23. It is not always possible to suggest effective remedies for pests and diseases. One way of combating them effectively is as already pointed out elsewhere in the report to evolve new strains of crops resistant to them. In the case of insects it is also possible to introduce their natural enemies which would keep them in check. All these methods are being attempted. Much attention

was again devoted this year to sugarcane pests like borers and mealy bugs. The Mysore method of removing the basal leaf sheath of young canes and earthing them up and even mere earthing up without removing basal leaf sheath were found effective against borers under Coimbatore conditions. Seven larval parasites were collected and three of them were studied in detail. Detailed studies were also made of the alternate host plants of spotted and pink boll-worms of cotton. Incidence studies of boll-worms in cambodia cotton showed that infestation by spotted boll-worms ranged from 48 to 55 per cent in the middle of December and dropped to 4—7 per cent in the middle of January while infestation by pink boll-worm did not exceed 15 per cent. Nine parasites were reared from the caterpillars of spotted boll-worms and pink boll-worms with a view to study the extent of their attack on boll-worms. Observations were also made on the cotton scale and cotton jassid. In paddy, seasonal studies of fortnightly plantings were concluded and the results are being tabulated in order to find out if there is any relation between the weather factors and the infestation of paddy stem-borer at different stages of the crop. Light trap trials with petromax were effective only up to a distance of 60 to 130 yards in the case of the paddy stem-borer. Raking up the soil to expose the pupæ and spraying poisoned molasses gave satisfactory results against fruit flies. Ragi was found useful as a trap crop against tobacco pests, and tobacco dusting was found more effective than sulphur dusting against chilly thrips.

Control measures by means of parasitic Green Muscardine fungus were found quite effective against the larvae and pupæ of the coconut beetle but eggs were practically unaffected. Cholan earhead bug (*Calocoris angustatus*) does considerable damage at the time of the formation of cholam grain. Due to seasonal conditions, the incidence of the pest was comparatively low during the year but dusting cholam earheads with sulphur at the rate of 40 lb. per acre on the eighth day after their emergence was quite effective in killing the insects.

Two Moringa pests, *Stictodiplosis moringae* and *Noorda moringae* were studied in detail. It would appear from their life history that the best way of tackling them is to rake up the soil underneath the tree to destroy the pupae. Dusting with Pyrethrum powder was tested with success against the caterpillars of Diamond back moth (*Plutella maculipennis*) a serious pest on cabbage. Of the two known parasites of this moth, *Brachymeria erca rinata* and *Tetrastichus sokolowakii*, the former attacks the pupæ and the latter the larvæ, but the attacked larvæ turn into pupæ the next day. Castor mite (*Tetranychus telarius*), and Castor semilooper (*Achoea melicerte*) were also studied in detail and dusting with sulphur and spraying with lime sulphur were found effective against the former. As to the pests of stored grains, laboratory tests have shown that cholam when mixed with borax and copper carbonate was not touched by Calandra beetles, while

copper carbonate, sodium fluosilicate, and lime plus creosote checked their multiplication. Cholan was also found better preserved when mixed with neem leaves and *Acorus* rhizomes. Systematic work was continued on Acarina, Coccidae, Braconidae, Chalcidae, Ichneumonidae, Pyralidae and Noctuidae.

In regard to fungus diseases, the effect of nitrogenous manures on paddy blast (*Piricularia oryzae*) was studied in pot cultural experiments. The indication obtained was that increasing quantities on nitrogen tend to increase the disease in susceptible varieties and that for equal quantities of nitrogen, sodium nitrate induces greater susceptibility than ammonium sulphate. The highly resistant variety, Co. 4, remained unaffected. Frequent showers of rain, cloudy weather and high relative humidity at the time of flowering were very conducive to the spreading of the "Blast" disease. The study of Mahali disease (*Phytophthora arecae*) was continued with a view to find out a suitable mixture for spraying against this disease on areca palm. A two per cent Bordeaux Mixture with Casein or coconut oil as spreader has been found quite effective when it was applied once in the latter part of May and once towards the end of July. The life histories of cotton and redgram wilt (*Fusarium vasinfectum*) and horsegram wilt (*Macrophomina phaseoli*) were studied in detail and much valuable information has been obtained. A comparative study of wilt fungi in cotton and redgram has revealed that physiologically they are two different strains. Cotton wilt does not pass on to redgram *vice versa*. A third strain of *Fusarium vasinfectum* was isolated from chillie plants and is under study. Investigations have recently been started on two of the diseases on Citrus trees, viz., the stump rot of nursery stock at Panyam (Kurnool district) and the bark rot at Bezvada. The study of soft rot (*Pythium butleri*) of ginger suggests two possible methods of attack, viz., dressing the seed in a suitable manner before and after the storage of rhizomes and the inclusion of phosphatic manures in the existing manurial practice. Trials were continued to estimate the relative resistance of sugarcane varieties to Mosaic disease. Co. 215, Co. 335, Co. 355, Co. 434 and Co. 511 were found completely free while the percentage of attack in a dozen other varieties tested varied from 2 in Uba to 86 in Co. 213. Other virus diseases on brinjals, potato and tobacco were under observation and they were all found transmissible either by grafting or sap inoculation. Detailed examination of these diseases was not possible for want of a suitable virus house. A general survey of cereal rusts has disclosed the presence of the black, brown and yellow rusts of wheat, the dwarf and yellow rusts of barley and the black rusts of oats in the Nilgiris throughout the year. In the Palni hills only the brown rust of wheat was found all round the year. At Coimbatore, 'Black rust' and 'Brown rust' were observed for the first time in September 1937 when the infection on the first season crop of wheat was very high on the Nilgiris.

F. Livestock.

24. Cattle are maintained in several agricultural stations for the purpose of breeding but the main work of the improvement of livestock is confined to the Livestock Research Station, Hosur. There were at the end of the year 713 cattle at Hosur as against 697 last year. Of these, 372 were cows and heifers, 156 stud and young bulls, 61 heifer calves, 63 bull calves and 61 work cattle belonging to cross-bred, Scindhi, Kangayam and Hallikar breeds. Forty-four bulls, 33 cows and three calves were sold during the year for the purpose of breeding.

(i) *Cross-bred herd*.—As in previous years, cows and heifers were mated to Scindhi bulls with a view to breed back to the indigenous Scindhi breed. A large proportion of these cows, when they are in milk, are maintained at the Agricultural College, Coimbatore, for milk supply and are sent back to Hosur when they are about to go dry. Young stock are kept at Hosur for rearing. On an average, there were 77 cows at Hosur and 206 cows at Coimbatore in milk and they yielded 10.9 lb. and 14.2 lb. of milk per head per day as against 13.3 lb. and 14.6 lb. respectively during the last year. At Coimbatore, two cows, Nos. 323 and 287 gave a maximum daily yield of 55 lb. and 58 lb. of milk respectively. The reduction in yield at Hosur is due to severe attack of foot and mouth disease in April 1937 and to inadequate grazing due to low rainfall.

(ii) *Scindhi herd* consisted of 178 animals, made up of 109 cows and heifers, 39 bulls, 13 heifer calves, 15 bull calves and 2 work cattle. On an average, 35.7 cows were in milk and yielded at the rate of 11.3 lb. per head per day. Forty-five cows went dry. Of these, one yielded above 8,000 lb., four between 6,000 and 7,000 lb., 14 between 4,000 and 5,000 lb., 12 between 3,000 and 4,000 lb. and 13 below 3,000 lb. during the period of their lactation.

(iii) *Kangayam herd*.—There were at the end of the year, 357 animals consisting of 186 cows and heifers, 75 bulls, 35 heifer calves, 34 bull calves and 27 work animals. 61.5 cows were in milk and the daily average yield of milk was 6.2 lb. per cow. 75 cows went dry during the year. Only six of them yielded 3,000 to 4,000 lb. of milk during the lactation; 17 yielded between 2,000 to 3,000 lb. and 36 between 1,000 to 2,000 lb. while 16 gave less than 1,000 lb.

(iv) *Hallikar herd* had 36 cows and heifers, 15 stud and young bulls, six heifer calves and six bull calves. 31.1 cows were in milk but none of them were milked as they were all poor milkers.

(v) *The Ongole herd* consisting of 28 cows and heifers, 20 stud and young bulls, two heifer calves, two bull calves and 28 work animals, was maintained at Guntur. 8.4 cows were in milk and yielded at the rate of 8.6 lb. as against 12.0 lb. last

year per cow per day. The daily average of the best cow came to 14.4 lb.

Buffalo herd.—At Guntur, there were 47 buffaloes yielding milk. Their average milk yield was 165 lb. per day per cow as against 2003 lb. in the previous year. Buffalo No. 58 completed her lactation during the year and gave a total yield of 8,172 lb. of milk in 393 days with a daily average of 208 lb.

Bellary sheep.—The flock consisted of 86 sheep at the end of the year. They were sheared twice as usual in March and September. The average annual yield of wool amounted to 3 lb. and 1 oz. per ram and 2 lb. and 8 oz. per ewe, the average for the whole flock being 2 lb. and 11 oz. The best ram gave 6 lb. and 3 oz. and the best ewe 3 lb. and 10 oz.

Poultry.—Four important breeds, White Leghorn, Rhode Island Red, Light Sussex and Black Minorca and two indigenous breeds, Chittagong and local were maintained. At Hosur, there were 325 birds in all. 78 of them produced 12,020 eggs with an annual average of 1669 per bird as against 1698 last year. The maximum annual yield of an individual hen of white Leghorn was 230, of Rhode Island Red 215, of Light Sussex 183, of Black Minorca 190 and of Chittagong 160. The percentage of hatchability of eggs varied from 41 to 56.8 in different incubators and under broody hens it came to 51.3.

A fairly large number of birds were maintained at seven other agricultural stations.

G. Implements.

25. The work of the research engineering section mainly consists of designing, testing and improving the agricultural implements and machinery made in India. The popularity of Cooper No. 11 as a cheap and efficient plough continues. Cooper No. 25 and Kirloskar's Gurjar No. 2 ploughs, both similar in size, are in great demand and the above three ploughs have practically eliminated all foreign competition. Cooper No. 34, similar to Cooper No. 11 in design, is as good at work as the Ransome's Victory plough and very much cheaper than the latter. It has since been copied by Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, and samples have been received from them for test. Samples of other ploughs received from Messrs. Cooper Engineering Works, Satara, and Kirloskar Bros., Kirloskarvadi, are under trial. The light ridge plough designed by the Agricultural Engineer and produced by all the leading agricultural implement manufacturers in India has been so well received in spite of its high price that no less than 235 ploughs of this design were sold during the past one year since it was first put on the market. The total number of iron ploughs of all descriptions sold during the year throughout the province reached a record figure of 4,339 (excluding 918 ploughs sold by private agencies) as against 3,000 sold last year, only 86 of them being

imported ones. The mechanical seed drill received considerable attention during the year and with the latest alterations it has given highly satisfactory results. A simple bullock drawn implement known as Basin Furrower has been designed for the purpose of making shallow basins in furrows to prevent soil erosion and to conserve soil moisture. In December 1937, it gave satisfactory results in hard, gravelly, red soils near Anantapur, and is now being tested in Kurnool, Bellary and Anantapur districts where every effort is being made to conserve soil moisture. A light disc roller comprising a simple frame with a rotating axle on which are mounted a number of discs at uniform spacing was designed last year at the Agricultural Research Station, Aduturai, for incorporating green manure into the puddle in paddy land. The implement is light enough for one pair of small animals and completely buries the green leaf to a depth of two to three inches by passing it once. The implement has since been refined in the Research Engineering Workshop at Coimbatore and its samples will be sent out for trials in districts. Trials were continued with the new spade and blade rollers designed by the Agricultural Engineer for puddling paddy lands. The design was altered with a view to make it more efficient and light enough for one pair of ordinary cattle. The implement looks promising as a puddler and a green manure trampler for wet cultivation and a clod crusher for dry cultivation. A number of hand power chaff-cutters made in India were tested during the year. Practically every one of them was found satisfactory at work but they are all beyond the means of a poor ryot. The Agricultural Demonstrator, Ootacamund, has designed a simple manure distributor for uniform application of artificial fertilisers. It is worked with hand and does not require cattle. The device is very light and simple and has given satisfactory results. It is likely to prove very useful for the application of manure to potato crop on the Nilgiris where ordinary cultivators cannot afford to have working cattle. Further minor improvements were carried out to the improved circular whote and the Provincial Agricultural Research Committee has reported that this lift was a distinct improvement over the existing type and also simpler to handle. The lift has entered the competition for award of prizes and medals by the Imperial Council of Agricultural Research for improvements in water lifts.

H. Trial plots.

26. The results obtained at the Agricultural Research Stations are not at once brought to the notice of the cultivator. They are further tested for a period of three years under local conditions in districts and are offered to the cultivator by means of practical demonstrations only if they are found successful at the end of this period. The cultivator places a portion of his land at the disposal of the Agricultural Department for these tests. Any extra expenditure over that usually incurred by him for the same crop is met by Government and the yield is taken over by him. There were

1,026 trial plots in paddy, ragi, sugarcane, cotton, jonna (chola), korra (tenai), and tobacco, as against 902 in the previous year.

Paddy.—Of the Berhampur strains, only Boroponko 238 and Bayahunda 1,615 proved superior to local yield by 25 and 21 per cent respectively. The Anakapalle strains like Sunkisannam 9, Mypali 7, Bangarutheega 9 and 155 were tried with success in the new areas of the Vizagapatam district. They gave increased yields of 20 per cent, 11 per cent, 16 per cent and 9 per cent, respectively, over the local variety. In the II Circle, Adt. 11 and A.E.B. 65 were compared with Molakolukulu. Adt. 11 fared better than the other two. Co. 2 and Co. 7 were compared with Iswarakora, a coarse red riced variety. Co. 2, a fine white riced variety, was found better in the IV Circle, Vadan samba selections show some promise, while a Muthusamba selection newly released from South Arcot district was also found to give better yield than the locals. In the V Circle, Konakuruvai strain 5,905 gave better yield than the local Konakuruvai in Tanjore district. It did not, however, fare better than the local in Trichinopoly district. The strain 5,905 is of a longer duration. The quality of its rice is fine and liked by the ryots. Adt. 15 gave 20 per cent more yield than local Konakuruvai. Adt. 14 is earlier by ten days and gave 8 per cent increased yield over local kar. In the VI Circle, Co. 3 has given an extraordinary yield of 6,000 lb. of grain per acre in Madura taluk. The trial has to be repeated.

Sorghum.—At Bezwada, J. 75 and J. 103 gave about 20 per cent more yield than the local. There were twelve trials in the Kurnool division. No. 28/3 and 224 gave better results than local as in last year. In the V Circle, A.S. 2095 gave 13 to 22 per cent increase over the local and is much liked by the ryots.

Groundnut.—A.H. 25 and A.H. 45 (H.G. 1) have done well in all the places tried in the I Circle; they gave 27 and 12 per cent increase respectively over the local variety. In the V Circle, A.H. 25 gave 15 to 20 per cent higher yield over local and is longer in duration by a week.

Ragi.—In the I Circle, No. 525 and V.Z.M. 33 yielded 9.5 to 10.3 per cent more than the local. Doona Ganti gave 17.9 per cent increase over the local variety. In the V Circle, E.C. 593 was found a better yielder than the local by 11 to 13 per cent and 15 days longer in duration.

Cotton.—X. 43 and X. 20 at Nandigama gave 16 per cent and 39 per cent more yield respectively than the local. In Kurnool division, three new strains yielded better than N. 14. In Bellary division, H. 1 is the most popular strain. H. 1 is best suited for the conditions prevailing at Adoni and when it is grown there it spins up to 35's warp counts in normal years. It gives the best results in the Guntakal area. It is gaining popularity in the Tadpatri area owing to its higher yield but due to mixing its spinning quality is reported to have gone down to 18's against 20's in the Jammalamadugu area.

Sugarcane.—In the IV Circle, the sugarcane trials once again showed the superiority of the Coimbatore selections to the local. In the V Circle, in a trial of seven varieties, P.O.J. 2878 and Co. 419 were found to be the best. Co. 281 and Co. 352 both gave double the outturn of the local red cane. In comparative tests between Co. 352, 281, 353, and Fiji B, Co. 353 and Co. 281 gave 23 per cent and 6 per cent more yield, respectively, than Fiji B. Co. 352 and Fiji B gave equal yield.

Cumbu.—In the V Circle, Punjab cumbu yielded 12 to 20 per cent more than local but it is longer in duration by 15 days under irrigation. In the VIII Circle, M.S.P.T. 2229 (Kottappulli cumbu) has done very well and is being issued to the cultivators.

Korra.—New strains were compared for yield with the local in the II Circle at Atmakur, Gurzala, Vinukonda and Nandigama. Only at Nandigama, they were found to yield better than the local. In Kurnool division of the III Circle, Nos. 132 and 140 gave higher yields than local.

Tobacco.—In the VII Circle, Virginia tobacco was tried in eight centres in Kasaragod taluk, and it has created a good impression among the ryots. The produce is under examination.

Wheat.—Pusa 111 has done well at Ootacamund.

V.—DEMONSTRATION.

27. The advantages of the improved seed and better methods of cultivation of all important crops like paddy, sugarcane, cotton, groundnut, ragi, etc., were brought home to the cultivators by means of practical demonstrations on a large number of plots in their own fields and at their own cost. This method of educating the cultivators is, besides being less costly than maintaining demonstration farms by the Agricultural Department, quite effective as they themselves can watch the crops from the beginning to the end and calculate profit and loss. The demonstration farms are not only viewed with suspicion by the cultivators but are also rarely visited by them. There were, during the year, 7,963 demonstration plots in the cultivators' fields spread over the whole presidency as against 7,554 in the last year. A large number of other demonstrations of improved and labour saving implements, better preservation of farm-yard and compost manures, treatment of seeds against fungoid diseases and spraying against pests and diseases were also conducted. All these demonstrations invariably showed the advantages of the improvements recommended by the department.

In previous years' reports reference was made to the intensive propaganda by the appointment of 63 demonstration maistries in nine taluks of the Vizagapatam district. This is the third year of working of the scheme, but during the year under report the season was unfavourable in most of the taluks.

The maistries carried out intensive propaganda in 360 villages, while particular improvements such as cultivation of new paddy varieties, conservation of manure and popularization of improved implements were extended to 948 villages.

A comparative statement showing the extent of agricultural improvements effected in the taluks under the scheme during 1937-38 as compared with those of previous three years is given below:—

Improvement.	1934-35 (31 centres provided with demonstration maistries or demonstration coolies).	1935-36 (72 cen- tres).	1936-37 (72 cen- tres).	1937-38 (72 cen- tres).
(1)	(2)	(3)	(4)	(5)
	ACS.	ACS.	ACS.	ACS.
1 Introduction of improved varieties and strains of paddy.	96,313	72,515 *	97,877	100,240
2 Planting of thin sown seedlings (paddy).	42,643	29,496 *	55,969	66,287
3 Green manuring	23,811	4,768 *	12,687	20,362
4 Introduction of Co. 213 sugarcane.	1,534	4,452	6,297	7,218
5 Introduction of other improved varieties.	63	195	399	464
6 Wider planting in lines ..	4,641	3,370 †	6,814	6,476
7 Interculturing by bullock power.	381	838	1,826	2,505
8 Planting with improved sugarcane seed material.	3,635	5,374	5,898	6,142
9 Ragi strains	564	628	1,048	1,443
10 Ganti varieties	..	..	165	144
11 Graded jonna seed	30	563	981	1,693
12 Treatment of jonna seed against smut.	57	602	658	1,540
13 Groundnut sowing in every furrow.	1,343	2,859	7,041	17,376
14 Cultivation of plantain on improved lines.	607	555 ‡	571	1,125
	NUMBER.	NUMBER.	NUMBER.	NUMBER.
15 Improved furnaces constructed.	123	465	681	710
16 Iron banded sugarcane mills ..	44	292	228	55
17 Properly covered manure heaps and pits.	4,185	17,115	20,501	30,456
18 Conservation of urine	2,250	6,829	10,168	16,822
19 Composts	435	454	875	1,594
20 Sale of Cooper, Gurjur and Ridge ploughs.	315	492	546	273
21 Pests and diseases tackled (excluding smut on Cholan).	252	664	1,093	1,583
22 Bee-hives maintained	2	4	28	61
23 Sale of improved eggs	36	387	752	98
24 Sale of improved birds	16	85	337	207
25 Breeding bulls maintained under premium scheme.	..	1	1	6
26 Demonstration plots	654	1,582	1,128	1,203
27 Trial plots	76	237	354	223
28 Demonstration with imple-ments.	..	..	1,705	2,998

* Set back due to bad season.

† Set back due to demonstrators and their staff being engaged at the time in the training of candidates for maistries' posts at Anakapalle.

‡ Decrease due to a large fall in the Yallamanchilli sub-circle on account of competition from East Godavari.

These figures sum up the progress since the introduction of the scheme in May 1935. The progress is by no means spectacular; it is slow and steady.

Constant attention is paid by the demonstration staff in controlling common pests and diseases of crops. The noteworthy improvement in the year under report is the increased number of bee colonies hived and maintained. The number increased from 2 in 1934-35 to 61 in 1937-38. The progress in the supply of improved birds and eggs received a set back during the year owing to the sudden out-break of fowl cholera. The incessant propaganda for the maintenance of good breeding bulls resulted in a keen demand for them. The number of demonstrations with imple-ments rose to 2,998 during the year from 1,705 in 1936-37. The fall in the number of sugarcane mills and iron ploughs sold in 1937-38 was due to the greater number of these sold in the previous years.

Apart from its actual progress as the above statement shows, the scheme has served to gain wide recognition all over the district to the usefulness of the Agricultural Department and the ryots have begun to appreciate the services of the Agricultural demonstrators and their maistries. The scheme has laid a sure foundation for orderly progress to a definite goal.

Exhibitions and Shows.

28. Agricultural Exhibitions and Shows were staged as usual during festivals, jamabandi camps and health week celebrations. The number of exhibitions held during the year was 352 as against 299 in the previous year. Special mention may be made of the exhibitions held at Gadithamadugu and at Proddatur in conjunction with cattle fairs arranged under the auspices of the District Economic Councils. A farmers' day was arranged at the Agricultural Research Station, Hagari and the cultivators were taken round the station and the experiments conducted thereon, explained to them. At the exhibitions held at Karur and Srirangam, an Agricultural drama, "Absentee Landlord" was enacted by the demonstrators of the circle. The rural exhibition at Tritala was the first of its kind where prizes were awarded for the best crops, for the best methods of the conservation of manure and for the best products exhibited by the farmers. Associated with this exhibition was a baby, cattle and cottage industries show where lectures on subjects relating to health, co-operation, veterinary and agriculture including marketing were delivered.

Ploughing and weeding competitions also were held at various places and prizes in the form of ploughs and mhote wheels awarded.

One thousand two hundred and forty-three lectures with and without the aid of lantern were delivered during all exhibitions, jamabandi camps and conferences.

The three motor exhibition vans toured throughout the Presidency except the VIII Circle. The second exhibition van became unserviceable and was sold in auction.

Items of Propaganda.

(1) Crops.

29. (a) *Methods of cultivation—Paddy.*—The main cultural improvements advocated are reduction in seed-rate, raising thin paddy nurseries, transplanting of seedlings in twos or threes, early and efficient tillage of seed-beds with improved ploughs and adequate manuring. As a result of continuous propaganda and demonstrations, the ryots have now understood the value and the benefits of economic planting. Recently counts were taken at random in Cuddalore division and it was found that there were only five seedlings on an average in each hole in the place of ten to fifteen seedlings about 20 years ago. It may therefore be said that about 60 per cent reduction in seed-rate has taken place in this division. The practice of thin sowing of nurseries and economic planting of seedlings have become almost general in the V circle. Other improvements effected in paddy cultivation are the use of improved iron ploughs.

Sugarcane.—In the I circle, line planting of sugarcane was done over an area of 8,068 acres. Intercultivation with bullock power is gaining ground in Vizagapatam district as a result of persistent propaganda to reduce the cost of cultivation of sugarcane. In the II circle, there has been a considerable increase in the area under sugarcane in the Kistna delta since the Vuyyur factory began to function. Intensive propaganda, in regard to varieties, methods of cultivation, is being done in the factory zone and 3 demonstrators were specially posted for three months during the harvest and planting season. In the III Circle, work has been concentrated on the propagation and supply of superior varieties. Co. 290, one of the most popular varieties, is reported to stand ratooning well and is mostly grown in the Factory area at Hospet; it fetches a premium of Re. 1 per ton over local Pundia cane. In the IV Circle, trenching by the use of iron ploughs like the Victory, Chattanooga and the steel ridge ploughs was demonstrated, and the ryots were advised to select disease-free setts for planting. For multiplication of seed material, "short crop" method was made popular in Vizagapatam district and in the Nellikuppam factory area. The total area in the Presidency under the improved methods of trench and line planting of sugarcane is estimated at 38,208 acres.

One thousand two hundred and fifty-four improved furnaces for making jaggery were constructed during the year as against 1,833 of last year. In the I Circle alone, 115 improved sugarcane mills were introduced as against 257 of last year. The reduction in the number in 1937-38 was mainly due to the large supply of mills in the previous year and to some extent to the increased consumption

of sugarcane by sugar factories. Two thousand two hundred and fifty-three demonstrations on the preparation of good jaggery were conducted during the year as against 568 of last year. Of these, 105 were of cream jaggery.

Cotton.—The advantages of line sowing of cotton were demonstrated in the VIII Circle. Sowings in February are becoming popular in the IV Circle and an early type of Cambodia cotton 4,383 is being tested as a summer crop in the wet lands after paddy. In the V Circle, distribution of improved strains of cotton seeds and line sowing of Cambodia formed the main lines of improvement. Drill sowing is on the increase in VI Circle, especially in the Tinnevely district. The area under drill sown cotton was 40,966 acres as against 29,124 acres in the previous year.

Fruits.—Advice on the selection of fruit plants and their correct method of planting, raising of suitable subsidiary and catch crops, pruning and manuring and the control of pests and diseases were the main activities that engaged the attention under fruit cultivation. Trench system of irrigation was introduced in the II Circle, and 350 acres of gardens were intercultivated with improved implements.

Groundnut.—In the Vizagapatam district, groundnut was sown in every furrow on an area of 17,376 acres against 12,409 acres in the previous year. The local practice is to sow it in alternate furrows. The main improvement aimed at is the closer spacing.

Coconut.—Proper spacing in planting and systematic cultivation were demonstrated to the ryots. Cultivation of catch crops, including fodder, with heavy manuring was encouraged with a view to reduce the cost of production of coconuts in order that the coconut growers may be able to successfully compete with importers. 530 acres were intercultivated with iron ploughs.

(b) *Methods of manuring.*—The wet lands particularly in the V Circle are deficient in both nitrogen and phosphoric acid as a result of the depletion of soil fertility by the high yielding strains of paddy. Ryots are therefore advised to supplement the local manure by growing, wherever possible, suitable green manure crops and ploughing them in along with phosphatic manures. About 288,283 acres were under green manure in the whole Presidency as against 189,019 acres of last year.

Ryots were advised to use artificial manures in combination with organic manures and were directed to manure firms for their requirements. The catch of fish during the year was poor, and the supply of fish manure therefore fell short of the demand. The importance of liming soils in the Nilgiris was demonstrated on 13 acres belonging to 38 potato growers. Trials with various manure mixtures sold to potato growers were also made to find out the merits of these fertilizers and to appraise the growers of their value. Chemical manures were applied over an area of 93,390 acres of paddy and 10,449 acres of sugarcane as against 43,722 acres and 6,270 acres respectively in the previous year.

(e) *Seed distribution—Cotton—(a) Cambodia cotton.*—In the I Circle, Cambodia cotton was tried for the first time as an irrigated crop in Bhadrachalam taluk and the progress of the crop was satisfactory. In the II Circle, Cambodia selection No. 1742 gave about 10 per cent more yield than Co. 2 at Nandigama. In the IV Circle, 15,405 lb. of seed were sold by the departmental depots and 5,000 lb. by the South Arcot Co-operative Loan and Sale Society. In the V Circle, a ryot of Manaparai had his seed-farm Cambodia kapas ginned at Dindigul and distributed 15,200 lb. of seed under the departmental seal. 284 acres under Cambodia cotton, as against 221 acres of last year, were arranged under seed-farm conditions in the VI Circle. In all, 312,126 lb. of improved Cambodia seed were distributed for sowing during the year as against 249,355 lb. of last year, of which the VIII Circle alone was responsible for 188,507 lb. as against 148,000 lb. of last year.

In the Presidency, the total area under the improved strains of Cambodia during the year was 246,367 acres as against 206,550 acres in the previous year. It is estimated that the acreage of these strains in the VIII Circle alone was 180,022 acres.

(b) *Karunganni cotton.*—This is grown only in the V, VI and VIII Circles. 2,071 acres were under seed farms and 252,470 lb. pure seed were distributed during the year as against 60,624 lb. in the previous year. The strains recommended are K. 1., A. 10 and C. 7. It is estimated that 203,924 acres were under these strains during the year as against 165,440 acres last year.

(c) *“Westerns” cotton.*—This cotton is confined to III Circle and H. 1 is the strain under distribution. 204,171 lb. of this seed were distributed. The area sown to this strain amounted to 222,843 acres.

(d) *“Northerns” cotton.*—This is also confined to III Circle and N. 14 is the chief strain under distribution. 23,174 lb. of seed were distributed during the year, and the area under this cotton was 4,368 acres as against 3,925 of last year. N. 14 has been fetching a premium of Rs. 30 per candy of 500 lb. lint over the prevailing price of “White Northerns” for the last three years. Messrs. Binny & Co. have been responsible for making this strain popular by offering the above premium. The area under this cotton has not expanded owing to its low ginning percentage.

Coconut.—During the year, coconut cultivation received a set back by low prices for coconuts. 14,676 seed nuts and 4,306 seedlings were supplied by the department during the year.

Groundnut.—In the I Circle, groundnut strains A.H. 25 and A.H. 45 (H.G. 1) were introduced in an area of 110 acres. In the II Circle, short duration varieties are preferred by the ryots if late rains fail. A.H. 45 (H.G. 1) is about a fortnight later than the local bunch variety and has to be lifted before the pods are ripe, for fear that the soil would become very hard. Under ordinary conditions the two strains give an extra yield worth

Rs. 4-8-0 per acre. In the V Circle, A.H. 32, bunch variety, is liked for its earliness and better price. In the VIII Circle, A.H. 25 proved satisfactory and 9,600 lb. of this seed were purchased from ryots for distribution in the next season. In the whole Presidency, a total quantity of 71,943 lb. of seed of all improved varieties were distributed during the year.

Paddy.—In the I Circle, 4,881 acres of seed farms were arranged during the year and 2,338 tons of seed are expected to be available for next year's sowing. The seed available from the Agricultural Research Stations is mostly supplied to the seed-farm ryots with a view to maintain the purity. In the II Circle, MTU. 7, Atragada 471 and Konamani 3414 have become popular and in a few places G.E.B. 24 and other Coimbatore selections find favour with the ryots. For the second crop, Garikasarnavari 925 is preferred. In the II Circle, 562 acres under seed farm conditions and 790 acres with approved seedsmen were arranged for the multiplication of pure seed. G.E.B. 24 continues to be popular in the III Circle. In the Kurnool division alone, the quantity of seed distributed was 6,215 lb. as against 2,783 lb. of last year. In the IV Circle, the paddy seed distributed amounted to 94,671 lb. as against 42,544 lb. of the previous year. In the V Circle, seedsmen and co-operative bodies have agreed to multiply and distribute the approved strains under the guidance of the department. In this Circle during the year, 152,185 lb. of paddy seeds were distributed by the department, besides 826,795 lb. by ryot-seedsmen and co-operative bodies. In the VI Circle, nearly 953 acres were under G.E.B. 24, Adt. 11 and Co. 2, under seed farm. In the VII Circle, 53,728 lb. of seed of different strains received from the Agricultural Research Station, Pattambi, were distributed. Of these strains, Ptb. 2 (Ponnaryan) and Ptb. 9 (White riced Tavalakannan) are more popular on account of their higher yield ranging up to 40 per cent and Ptb. 10 (Tekkanchira) for its short duration and cosmopolitan character. In the VIII Circle, several improved varieties were distributed. In all Circles, the seed distribution work is mainly done by ryots themselves while the department issues seed to selected ryots for seed farms and introduces promising new varieties released by the Paddy Specialist.

The total area under different improved strains in the Presidency, including natural spread, is estimated at 1,774,024 acres as against 1,395,043 acres in the previous year. The total quantity of paddy seed distributed in the whole presidency was 2,718 tons.

Pepper.—The yield of pepper was poor during the year and the price also was very low. 22,700 cuttings were supplied to ryots, mostly in the northern taluks of South Kanara where pepper is a rare crop.

Potatoes.—“Great Scot” is the variety largely distributed. 103,675 lb. of seed material were distributed to ryots at Coonoor and Ootacamund. The average yields were in general satisfactory and varied from 630 to 750 maunds for early crop, 650

to 860 maunds for main crop and from 645 to 760 maunds for the second crop seasons. About 80 maunds of seed material were also distributed in Salem. The area under improved strains on the Nilgiris is estimated to be 12,068 acres and the total quantity of seed distributed in the whole presidency amounted to 106,590 lb.

Ragi.—The two strains evolved at the Agricultural Research Station, Anakapalle, viz., Nos. 525 and 355 were popular in Vizagapatam district and they were sown on an area of 1,421 acres. No. 525 has been found suitable for both early and late seasons. E.C. 593 was very popular in the III Circle, and nearly 90 per cent of the area in one village, Gundireddipalle in Kurnool district was cropped with this strain. It was in great demand in the IV and VIII Circles also, and has done well as a dry crop in parts of the Salem district. In the V Circle, E.C. 593 was cultivated in about 215 acres. The area under improved strains for the whole presidency is estimated at 7,532 acres, and the total quantity of improved seed distributed was 11,525 lb.

Sorghum.—The area under improved strains in the III Circle was 30,430 acres. T.1 jonna (white) remained popular in Bellary division, and 29/68 (yellow) in the Kurnool division. In the VIII Circle, peria manjal cholam is the most popular variety and among the selections of the Millets Specialist, A.S. 1575 has proved to be the best this year. The total quantity of seed distributed for the whole presidency was 22,145 lb.

Sugarcane.—In the Vizagapatam district, setts sufficient for 1,095 acres were made available from seed raised as short crop. In the II Circle, there has been a considerable increase in the area under sugarcane in the Kistna delta since the Vuyyur factory began to function. In the factory zone, Co. 243 is at present the leading cane. An area of about 50 acres was put under short crop under lift irrigation to serve as seed material. In Bellary division the most popular variety is Co. 290 which occupies an area of 2,654 acres. This variety is reported to stand ratooning and it is mostly grown around the factory area in Hospet since it fetches a premium of Re. 1 per ton over local Pundia cane. In the IV Circle, setts of Co. 281, P.O.J. 2878, Co. 419 and Co. 421 were distributed. Co. 281 and P.O.J. 2878 have quickly replaced Fiji B, as they have the advantage of ratooning well for a year. Two other varieties, Co. 419 and Co. 349, are coming into prominence in the Nellikuppam factory area and these are multiplied by 'short cropping.' In the V Circle, the Coimbatore thin canes, Co. 281, 352, 353 and 355 are spreading rapidly. They are of shorter duration and withstand drought and water-logged conditions. The scope for raising sugarcane in the Tanjore delta as a commercial crop is, however, limited owing to the irrigation and drainage difficulties and want of a factory in the vicinity. 378 acres were under cane in Tanjore district which represents 45 per cent of the total area under cane in the Circle. Messrs. Parry & Co. purchased canes from Shiyali, Kumbakonam and Negapatam taluks and if they

continue the purchases on a larger scale, the extension of cane cultivation in the delta may receive an impetus. The Public Works Department are also arranging in consultation with this department to fix certain areas suitable for sugarcane cultivation. Co. 213 is considered most suitable in the VIII Circle in garden lands where there is scarcity of water. Co. 413, 419 and 421 have so far proved to be the heaviest yielders. The total area under improved strains in the presidency was 46,064 acres as against 42,650 acres in the previous year.

Tapioca.—In the VII Circle, the department encouraged the cultivation of improved and short duration varieties, and 113,650 setts sufficient for planting in about 30 acres were supplied to the ryots.

Tobacco.—In the II Circle, there was an area of 6,185 acres under H.S. Nos. 8 and 9. Uniformity in size and colour of leaf contributed to an increased profit of Rs. 20 to Rs. 25 per acre by the cultivation of these strains compared to the control.

(2) Fodder.

29. In all circles, efforts were made as usual to persuade the ryots to grow fodder crops to supplement their paddy straw. Fodder crops like *pillipesara*, sunnhemp, *kolukkattai* grass, and lucerne, were introduced in several circles. Small areas have also been put under Guinea grass and maize. In the IV Circle, guinea grass and elephant grass slips and Teosinte and lucerne seeds were distributed. For the first time, trials were started in the Forest Panchayat areas in the Chingleput district with the growing of *kolukkattai* grass. Silage was made from groundnut haulms in Kalahasti and the material prepared was fair. In the VI Circle, as reported last year, the Madura Municipality, the Palni Devastanam and the Fathers of the Sacred Hearts College in Kodaikanal Hills continue to grow guinea grass and elephant grass. Silage was made in Tinnevely Division. In the VII Circle, hill grass was, as usual, conserved as hay or as silage and ten silage pits were filled during the year. In the whole presidency, the following quantities of seeds were distributed for fodder:—

	Number.
Guinea grass and elephant grass slips ..	15,500
	LB.
Fodder cholam	6,107
Teosinte	109
Fodder maize	36
Lucerne	92
Kolukkattai grass seed	1,297
Kollaganjeru	126

(3) Fruits and Vegetables.

30. In the Vizagapatam district, cultivation of plantain received a great impetus and the area increased from 576 acres in the previous year to 1,151 in the year under report. Plantain cultivation has also been introduced in the wet lands in Tanjore district where 128 acres were under this crop during the year as against 100 acres of last year. The area under cashewnut also is on the increase in the V and VII Circles due to departmental propaganda and 10,204 lb. of selected seed of cashewnuts and 600 cashewnut seedlings were supplied by the department. Other fruit plants supplied during the year were —

	Number.
Plantain suckers	25,544
Mango grafts	37,143
Pine-apple suckers	57,627
Citrus, sapotas, oranges, limes, etc. ..	10,778

In the interest of better nutrition, propaganda was made to grow vegetables in the III Circle, chiefly tomatoes. Messrs Pocha & Sons supplied free packets of vegetable seeds for trial by the ryots. In the V Circle, seeds of select varieties of brinjals, beans, radish, carrots, soya beans, tomatoes and melons were distributed to ryots from the Agricultural Research Station, Aduturai. Bellary onion is finding favour with the ryots in Coimbatore and Salem districts and they were supplied with 31 lb. of this seed departmentally. In the V Circle, 49 lb. of Dhulia onion seed sufficient for 16 acres were distributed to the ryots.

(4) Implements.

31. Demonstrations of the working of the improved agricultural implements were, as in previous years, continued. The following statement shows the number of demonstrations conducted in the presidency with improved implements:—

	Number of demonstrations.
Improved*ploughs	9,482
H.M., R.E., and ordinary guntakas ..	1,332
Mhote wheel	760
Triangular harrow	99
Bund-forming implements	284
Planet junior hoe	406
Buck-scraper	68
Chaff-cutter	183
Seed drill	34
Sprayers	997
Cultivators	536
Digging fork	67
Pruning implement	313
Turmeric polishing machine	172
Archemedian screw	43
Cane mill	8
Other implements	4,272

The implements sold during the year through departmental agency were as shown below:—

	1937-38.	1936-37.
	RS.	RS.
Iron ploughs	4,339	2,918
Spare parts for ploughs	5,187	4,528
Guntakas	81	20
Roll easy mhote wheels	409	413
Chaff-cutters	6	9
Seed drills	18	313
Bund-forming implements	14	24
Planet junior hoe	46	37
Buck-scraper	10	6
Sprayers and dusters	132	172
Sugarcane mills	117	293
Improved water lifts	30	5
Archemedian screws	1	4
Pruning implements	49	..
Other implements	686	231

The reduction in the number of mills is mainly due to large purchases in the previous year and to some extent to the increased consumption of sugarcane by sugar factories.

A light seed drill to replace the local paddy seed drill and a turmeric polisher were demonstrated in Chingleput and South Arcot with success. The sale of spare parts for ploughs in Pollachi taluk alone was 276 valued at Rs. 112 which is an indication that ploughs are in use. Research Engineer's improved light drill was successfully demonstrated in Coimbatore for sowing cholam.

(5) Livestock.

32. The usual propaganda with regard to the improvement of livestock was carried out by this department till 31st March 1938 when the Livestock Section was transferred to the Veterinary Department. The Agricultural Demonstrators inspected the bulls maintained by the District Boards of Chingleput, Coimbatore and Tanjore and gave advice regarding their proper maintenance and the rearing of calves. Great impetus was also given to the improvement of livestock in the VII Circle by the supply of breeding bulls, and encouraging the owners to feed their calves better. Cattle shows were organized and prizes to the best cattle awarded. The total number of breeding bulls maintained, including those in the contribution scheme, was 263 as against 178 in the previous year. The number of bulls on the premium scheme was 165, which includes those purchased by co-operative societies mentioned below out of the common good fund and brought under the premium scheme in accordance with G.O. No. 2281, Development, dated 15th December 1936:—

(1) Sri Andhra Nayaka Co-operative Society, Srikakulam, Kistna district;

- (2) Co-operative Society, Ambodichellapaliam, Coimbatore district;
- (3) Co-operative Union, Kambhanabaiti, Coimbatore district;
- (4) Co-operative Society, Kavandanpaliam, Coimbatore district;
- (5) Co-operative Society, Siruvallur, Coimbatore district;
- (6) Co-operative Society, Gobivarapaliam, Coimbatore district;
- (7) Co-operative Society, Ravuthur, Palladam taluk, Coimbatore district;
- (8) Agricultural Improvements Co-operative Society, Pudukkottai, Salem district;
- (9) Co-operative Society, Vengarai, Namakkal, Salem district;
- (10) Co-operative Union, Tiruvannamalai, North Arcot district;
- (11) Co-operative Bank, Vellore, North Arcot district;
- (12) Co-operative Union, Kalavai, North Arcot district;
- (13) Co-operative Society, Kampli, Bellary district;
- (14) Madura-Ramnad Co-operative Bank, Madura;
- (15) Co-operative Union, Uttamapaliam, Madura;
- (16) Agricultural Improvements Society, Vellar, Madura; and
- (17) Co-operative Bank, Tinnevely.

Poultry.

The American Arcot Mission, Katpadi, who have been granted a subsidy of Rs. 1,000 per annum for three years, carried on intensive propaganda in the villages round about for the improvement of the local birds by mating them with imported breeds, and distributed birds and eggs. The mission also organized an egg marketing centre at Katpadi. The Agricultural Research Station, Aduturai, was the main source for the supply of eggs and fowls of pure breeds to the ryots in the V Circle, some of whom have taken to rearing these birds and supplying eggs for setting. White Leghorn and the Rhode Island Red and their crosses have spread on the West Coast. The Devadhar Malabar Reconstruction Trust at Tanur, Tritala and Gopalapuram, are doing good work in poultry improvement. During the year, 1,057 birds and 3,508 eggs were issued as against 1,178 birds and 3,969 eggs in the previous year.

Apiary.

Assistance was given to the ryots in hiving wild colonies and supplying hives. Better method of extraction of honey was demonstrated in the I, V and VIII Circles. An interesting film on "Bee-keeping" showing the hiving of wild colonies and the methods of rearing bees and extracting honey was produced by Mr. N. Seshagiri Rao, District Traffic Superintendent, South Indian

Railway, and this was projected during the Health Week celebrations at Trichinopoly. The following statement shows the results of intensive propaganda on bee-keeping:—

	Number.
Number of bee colonies maintained	1,016
Bee colonies hived	419
Demonstration of better methods of extracting honey.	90
Bee-hives supplied to parties	219
Honey extractors supplied to parties ..	2

(6) Loans.

33. Takkavi loans were granted to ryots to the extent of Rs. 22,373 for the purchase of agricultural implements mentioned below against Rs. 16,660 granted in the previous year:—

	Number.
Ploughs	1,829
Water lifts	15
Mhote wheels	315
Cultivators, Guntakas, Dantulus, Drill sets, bund formers and buck-scrapers.	106
Sprayers	82
Spare parts of ploughs, etc.	206
Miscellaneous implements such as chaff cutter, secateur, digging forks, etc.	14

Loans for implements costing Rs. 25 and less were sanctioned by this department amounting to Rs. 17,318 while the Revenue Department sanctioned loans to the extent of Rs. 5,055. The increase in the amount disbursed year after year shows that ryots avail the system of loans for the purchase of the implements more readily.

(7) Manures.

34. *Farm-yard Manure.*—The department continued its propaganda on better methods of preservation of cattle manure in order to increase its quality and quantity. The number of manure pits, dry earth sheds and loose boxes maintained in all the Circles during two years is given below:—

	1937-38.	1936-37.
	RS.	RS.
Manure pits	52,482	37,799
Dry earth sheds	21,407	13,852
Loose boxes	53	60

Compost.—At Hospet and Proddatur, compost was prepared out of municipal rubbish by using night soil as starter. This method of making compost gives not only extra income to municipalities, but also keeps the rubbish dumping grounds in sanitary

condition. The Karur Municipality continued the Indore process of composting the habitation waste and distributed the manure for demonstration. The same process was also introduced by the Madura, Tinnevely and Calicut municipalities. The total number of compost pits maintained during the year was 3,063 as against 1,792 in the previous year.

Green manures.—This work was carried on in spite of difficulties due to seasonal vicissitudes. Daincha, sunnhemp, wild indigo (kolinji), Indigo, pillipesara and cowgram were recommended to the ryots as suitable crops for green manuring. In the II Circle, pillipesara is popular in almost all heavy wet land areas. It is grown as a pure crop or mixed with cholam in dry lands. In the V Circle, private dealers, co-operative agricultural societies and other organized bodies were encouraged to stock and distribute green manure seed to ryots. 2,000 pungam seedlings were supplied to the Executive Engineer, Cauvery-Mettur Project area, Tanjore, for planting along canal bunds to serve as a binder and to supply green leaf manure. Wild indigo has fairly established itself in the coastal villages in the VII Circle and in Palghat taluk the ryots are evincing greater interest in gathering their own seed. Arrangements have also been made with co-operative organizations in Palghat for the direct purchase and distribution of green manure seed. During the year the quantity of green manure seed distributed to the ryots was 408 tons including the quantity disposed of by private agencies.

Artificial Fertilizers.—These are not stocked by the department. As reported last year, the departmental activities were merely advisory in the matter of the use of the artificials and the methods of their application. Ryots were also advised to use them along with organic manures.

(8) Pests and Diseases.

35. Mahali disease in arecanut gardens broke out in South Kanara district and Ponnani taluk of Malabar district owing to heavy incessant rains. A special staff of two agricultural demonstrators and 10 fieldmen assisted by 30 climbers demonstrated the sanitary measures and spraying the affected gardens with bordeaux mixture. About 75 lakhs of arecanut palm were sprayed in South Kanara and one lakh in South Malabar. The department distributed 89 sprayers, 83,053 lb. of copper sulphate to the garden owners, besides 3,100 cwt. of chemicals and 183 sprayers supplied by the co-operative organization at Puttur. A special staff was employed in Rajampet taluk to combat "mottled leaf" disease in orange gardens. The treatment consisted in spraying the trees with a wash composed of zinc sulphate and lime. About 11,372 trees were dealt with. The application of crude oil emulsion against paddy silver shoot fly, which has been causing considerable damage to paddy in Chicacole, has given good results.

Nephantis serinopa, an insect pest on coconut, appeared in the coastal tracts in the West Coast. Parasites were liberated and the pest was brought under control. Other pests and diseases, against which remedial measures were demonstrated, were plant lice, thrips, etc., on tobacco, chillies, onions and vegetables, stem bleeding disease of coconuts, die-back and aphids of citrus, piricularia and blast of paddy.

(9) Agricultural Marketing.

36. *Marketing Surveys.*—The marketing surveys in respect of potatoes, ghee and butter, pears, apples and plums and peaches, citrus fruits and markets and fairs in the Presidency were completed and reports on these have been forwarded to Government. In addition, the surveys of barley, gram, maize, mustard and rape, coconuts, mangoes, sheep and goats, wool and hair and sugar were also undertaken during the year. Since 1936, final survey reports on 21 commodities have been submitted to Government.

Grade Standards.—For work in connexion with grade standards, samples of tobacco, ghee, wool and hair, barley and cane jaggery were collected from different markets and sent to the respective officers for analysis. The total number of samples sent so far including those of the previous years is 1,343. Certain alterations in the quality specifications of the different grades of Virginian tobacco of Guntur have been made and samples sent to the High Commissioner, London, through the Agricultural Marketing Adviser to the Government of India, Delhi.

A conference of the representatives of associations and mill owners dealing in groundnuts and the Central and Provincial marketing staff was held at Bombay in September 1937 to standardize the groundnut contract forms and fix quality specifications. The provisional contract forms were circulated for detailed consideration by the various interests concerned, and the terms were re-examined in the light of the observations made by certain association at a conference held in Delhi in April 1938. A final decision is expected to be reached at a representative conference to be held in Madras in November next.

Development work.—During the year under report, Virginian tobacco worth about Rs. 50,000 was graded and shipped under the standard grades of the Indian Tobacco Association, Guntur. Some of the cigarette manufacturers in England were surprised that such excellent quality of cigarette leaf tobacco could be obtained in India. Help was rendered to the association for the publication of a monthly bulletin giving information on improved methods of cultivation of tobacco, curing, grading, marketing, periodical statistics of acreage, condition of crop, stocks, etc. The Fruit Growers' Society organized at Koduru (Cuddapah district) was able to market in Madras City 8,880 baskets of oranges valued about Rs. 25,000 to the best advantage possible. Similar fruit growers' societies

were organized for mangoes at Vizianagram, for oranges at Puttur (Chittoor district), and for grapes at Michaelpalayam in Madura district. During the short period of four months—January to April the grape growers' society at Michaelpalayam marketed over 15 lakhs of pounds of fruits in about 50 places in and outside the Madras Presidency. Help was rendered to the pine-apple growers' society at Tellicherry to market its produce. Arrangements for the sale of potatoes of the Nilgiri potato growers' association through the Provincial marketing society were completed by opening a sale depot in Madras. The question of providing godown facilities in the producing centres so as to enable large quantities being marketed through the society was considered. A central egg marketing society was organized at Chinnaganjam. The society commenced work in the last week of March 1938, and over 10,000 eggs were graded and marketed through the provincial marketing society. As a result of the grant of concessional freight rates for wagon loads of bananas from some of the producing centres in the Circars to the chief consuming centres in North India, the traffic in bananas has increased. Preliminary investigations were carried out to open ghee grading stations at some of the main ghee producing centres in the Presidency.

The Provincial marketing board held three meetings during the year. Special consideration was given in these meetings to the reduction of railway rates and similar facilities for marketing of certain commodities. As a result of the efforts made in this direction, the Government have addressed the Central Railway Board to reduce the freight rates on betel leaves to North India, which are at present too high compared to the value of the goods. The Provincial marketing board addressed the Madras and Southern Mahratta and South Indian Railways to reduce the freight rates on pine-apples from Tellicherry to some of the important consuming centres in South India.

Special investigations, enquiries from the public, etc.—The marketing section, besides the marketing surveys, carried out a number of special investigations like the fish trade in the West Coast, the betel traffic in the Presidency and the necessity of a coastal road in Malabar for better marketing. Enquiries from the public and various bodies like producers' associations, co-operative societies and officers of Government departments, both within and outside the Presidency, in regard to market intelligence and statistics, are increasing from year to year.

Work through other agencies.

(1) Co-operation.

37. The Co-operative Loan and Sale Society at Anakapalle sold 107,272 maunds of jaggery worth Rs. 86,896. The Bimlipatam Society disposed of 6,800 bags of groundnut valued at Rs. 37,339.

One Loan and Sale Society was started at Proddatur. The following quantities of groundnuts were sold through the warehouses at Vriddhachalam, Tirukkoyilur and Cuddalore:—

	Quantity.		Value.		
	CANDIES.	LB.	RS.	A.	P.
Vriddhachalam ..	3,375	421	89,210	12	11
Tirukkoyilur ..	1,825	81	46,246	1	6
Cuddalore ..	2,729	159	80,590	13	0

The Central Loan and Sale Society at Cuddalore stocked and sold Co. 2 cotton and Nandyal Indigo seeds to its members. One Agricultural Improvement Society was registered in Ammanur in North Arcot district and an Agricultural Colonization Society was started in Avadi at the close of the year. The Kumbakonam Co-operative Agricultural Society, the Co-operative Stores at Kadiramangalam and Nidamangalam and the Lalgudi Sivagnanam Co-operative Agricultural Society distributed 37,732 lb. of paddy seeds, 61,679 lb. of green manure seeds, 76,168 lb. of bonemeal and 140,028 lb. of oil cakes. The Loan and Sale section of the Lalgudi Sivagnanam Co-operative Agricultural Society issued loans to ryots on pledge of agricultural produce. The Loan and Sale Society at Vallam has undertaken to multiply A.H. 25, groundnut under seed-farm conditions. At the request of the District Collector and the Executive Engineer, Trichinopoly, a special report was submitted on the reclassification of the sanded areas of Mutharasallur and on the irrigation needs of the wet lands of Krishnarayapuram. A cropping scheme also was drawn up for the cultivation of the Jail lands at the request of the Superintendent, Central Jail, Trichinopoly. The Co-operative organization at Puttur did useful work by distributing chemicals and sprayers on loan and sold 1,100 cwt. chemicals and 183 sprayers. Advice was given to Idigarai Agricultural Association, Sugarcane Growers' Association, Coimbatore and to six societies in Salem district in their work. In the matter of Co. 2 seed production and distribution, help was given to the Tirupur Co-operative Sale Society, besides the staff lent by the Indian Central Cotton Committee till 17th August 1937. Co-operative Societies purchased breeding bulls out of the common good fund and maintained them under the premium scheme.

(2) Agricultural Associations.

The fruit growers' association at Vizianagram conducted the fruit show during the year. Three agricultural associations were started during the year, two in South Arcot district and one in North Arcot district. The agricultural association in Trivellore continued to function and sold to its members ploughs and seeds worth about Rs. 400. The District Agricultural Association of Trichinopoly conducted an agricultural exhibition at Srirangam during the Vaikunta Ekadasi festival on an elaborate scale. The Tanjore Delta Mirasdars' Association continued to issue the journal, *Mirasdar*. Six agricultural associations were newly started in Tinnevely

district during the year. The Palghat Agricultural Association helped the Tritala co-operative organization with a grant of Rs. 25 for the conduct of a rural exhibition. This association also rendered financial aid to the poor ryots of the Palghat division to purchase green manure seed: it has also purchased three young breeding bulls. Although the District Economic Councils do not exist as such, their work is continued at special meetings convened by the Collectors once a quarter.

VI. LEGISLATION.

38. *Cotton Ginning and Pressing Factories Act*.—This Act continued to be in force. Five new ginning factories, four in Coimbatore district and one in Tinnevely district, were erected during the year. Although the total number of ginning factories were 643 on the list at the end of the year, there were only 523 factories actually working. There were no prosecutions for infringement of the provisions of the Act. Out of 70 pressing factories for which numbers were allotted, eight were removed from the list, as the presses were dismantled. Of the remaining 62, five did not work towards the close of the year under report.

The provincial draft amending bill to the Act referred to in the previous report was sent to Government after eliciting the opinion of the members of the Provincial Cotton Committee by circulation. The draft is now under the consideration of Government.

39. *Cotton Transport Act*—(i) *Single licences by rail*.—Twenty-eight single licences with a certified copy in each case were issued during the year. Of these, two related to imports of cotton lint to 2 mills in the 'Southern' protected area for manufacture and 1 to a consignment of departmental produce of Cambodia kapas sent from Agricultural Research Station, Anakapalli to Tirupur for ginning and sale. The rest of the 25 licences issued were for cotton waste most of which was booked from Pondicherry in small lots to stations in the North Arcot and Chittoor districts, for making beddings and pillows.

(ii) *Annual licences*.—Thirty general licences with 729 certified copies were issued to the cotton mills in the 'Southern' protected area, for import of ginned cotton by rail, during the cotton year 1937-38 (1st February 1937 to 31st January 1938), as against 20 licences with 324 certified copies issued in the previous year. Of the 729 certified copies, the mills utilized 578 copies and returned the remaining 151 copies as unused. The number of certified copies utilized in the previous year was 262.

In addition to the above, 27 general licences with 345 certified copies pertaining to the cotton year 1938-39 were issued to the mills during the period from 1st February 1938 to 31st March 1938.

(iii) *Licences by sea*.—One hundred and nineteen licences were issued during the year for the import by sea of 73,371 bales

of ginned cotton into the port of Tuticorin as against 60 licences for 68,976 bales issued in the previous year.

40. *Cotton Control Act*.—The enforcement of this Act prohibiting the cultivation and mixing of pulichai cotton (*g. neglectum*) was continued during the year in the three southern districts. Only a few stray plants of this cotton were found in the main crop and they were removed in all cases after issue of notices. The working of the Act during the year was satisfactory.

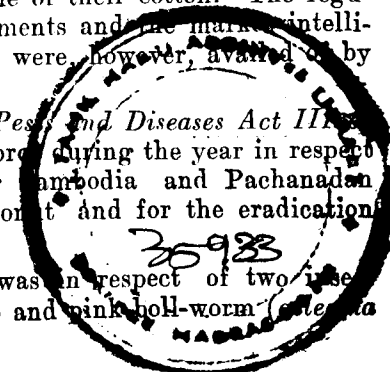
41. *Cotton Markets Act*.—The enforcement of the Madras Commercial Crops Markets Act (Act XX of 1933) in respect of cotton in the Tirupur Municipality was continued and the Tirupur Cotton Market Committee constituted under the Act continued to function. There were 8 meetings of the Committee during the year. Seventy licences were granted by Government under section 4 (1) of the Act for establishing or continuing places of business for the purchase, sale, etc., of cotton in the notified area, as against 86 in the previous year. The Committee issued licences to 109 buyers and sellers, 9 buyers, 9 sellers, 27 brokers and 57 weighmen. The corresponding licences issued during the previous year were 113, 13, 5, 27 and 72. Only one dispute was referred to the Committee for arbitration. An agreement was reached by the two parties and the arbitrator recorded the same in the register specially kept for the purpose.

From the 5th March 1937, the Committee started publishing the daily cotton market reports twice daily, one in the morning at 5 o'clock and the other in the evening at the same hour. The morning report contains the prices of cotton in New York, Liverpool and Bombay. The trend of the market, the statistical information maintained in the Committee's office, the daily purchases and sales in Tirupur with rates and the opening prices in Bombay and Liverpool are published in the evening issue.

Negotiations for the purchase by the Committee of the Holmes cotton market belonging to the Tirupur Municipality for Rs. 60,000 are now complete. The actual purchase is expected to be effected shortly in the current year. After the acquisition of the land the Committee can proceed to provide godown accommodation and other facilities, the want of which detracted growers from freely resorting to the cotton market yard for sale of their cotton. The regulated trade allowance, correct weighments and the market intelligence provided for by the Committee were, however, availed of by the growers with advantage.

42. *Pest Act*—*The Agricultural Pests and Diseases Act II of 1919*.—This Act continued to be in force during the year in respect of the diseases and insects affecting Cambodia and Pachanaden cotton, groundnut, palmyra and coconut and for the eradication of water hyacinth.

(i) *Cotton*.—The enforcement was in respect of two pests, stem-weevil (*pempheres affinis*) and pink boll-worm (*g. gossypiella*)



R
J. 211 8 N37
N38:2

gossypiella) attacking Cambodia and Pachanadan cottons in the districts of Salem, Trichinopoly, Madura (except in villages which are interspersed in the Ramnad district) and Coimbatore. As in the previous years there was delay in all the districts in removing cotton plants from fields before the prescribed date. As in the previous year, Kulittalai taluk of the Trichinopoly district contributed the largest area of 7,100 acres left uncleared till 15th October 1937, due to late sowings in November-December in dry lands. In the Madura district, the plants were not eradicated till 17th September 1937 on an area of nearly 1,390 acres and 346 prosecutions were sanctioned by the Collector. In Salem district 10 to 15 per cent of the crop was cut with sickle instead of being pulled out. In Udumalpet taluk of the Coimbatore district, the plants had to be pulled out by inspecting officers on 24 acres. Prosecution was sanctioned against 51 defaulters. In ten villages of the Coimbatore taluk (opposite to the Palghat gap), Cambodia cotton sown early in August was, as a special case, allowed to stand for the first time during the year by an amendment of the Government notification. This special concession has been extended to 1938 also on condition that the crops sown in August due to early rains in this area should be removed by 15th June of the succeeding year. In the Anamalai special tract of the Pollachi taluk, plants were left on the ground till 12th November 1937 in spite of an extension of time till 21st October. In this tract, 28 defaulters were prosecuted.

As indicated in the last year's report, the Pudukottah Darbar brought the Pest Act into force in the State for the first time during the year.

(ii) *Groundnut*.—The Act against the hairy caterpillar pest (*amsacta albistriga*) on groundnut (and other dry crops in a portion of the Vizagapatam district) was in force in portions of the Tekkali and Narasannapeta taluks of the Vizagapatam district, in South Arcot (Cuddalore taluk excepted) and North Arcot districts, and in portions of Musiri and Udayarpalayam taluks of the Trichinopoly district. The pest was effectively checked in all the areas. The working of the Act continued to be satisfactory.

(iii) *Palmyra and coconut*.—The enforcement of the provisions of the Act to check the disease of bud-rot of palms was continued in the three taluks of Palghat, Walluvanad and Ponnani of Malabar district. Of the 2,906 trees marked for operation, most of the diseased trees were cut in the Palghat and Ponnani taluks. As the nature of infection in Walluvanad taluk was not known, a complete survey of the area was undertaken and the work is in progress. The operation of the Act is to continue in 1938-39.

(iv) *Water hyacinth*.—The Act in respect of this aquatic weed was in operation in the whole of Tanjore and Chingleput districts and in parts of Trichinopoly, South Arcot and Malabar districts. Ryots were advised to collect the plants and compost them.

VII.—PUBLICATIONS.

43. The number of copies of the Villagers' Calendar printed in each language during 1937-38 was as follows:—

				RS.
English (1937 edition)	..	..	..	3,400
Tamil (1937-38 edition)	..	..	..	6,800
Telugu do.	..	..	..	5,000
Kanarese do.	..	..	..	1,700
Malayalam do.	..	..	..	2,700
Total	..	..	..	19,600

Free distribution of the Villagers' Calendars to the Local Boards, the officers of the Educational Department and others was stopped.

44. In addition to the annual publication of leaflets, bulletins, Villagers' Calendar, etc., short notes in English, Tamil and Telugu on the activities of the department were issued once a month for publication in the Local Dailies. Publicity of this kind has become a regular feature of the department and 29 notes on crops, fruits, plant diseases, insect pests, marketing surveys, agricultural implements, water lifts, malting of cholam as a cottage industry, improvement in the manufacture of palm jaggery, etc., were published during the year under report.

The undermentioned publications were issued by the department during the year 1937-38:—

Subject.	Languages in which published.	Price.		
		RS.	A.	P.
Books—				
The coconut. A monograph ..	English ..	3	6	0
Popular account of the activities of the Agricultural department from 1922 to 1935.	Do. ..	1	0	0
Rice in Madras—A popular Hand-book.	Do. ..	2	0	0
Leaflet series—				
(1) The leaf curl disease of chillies.	Tamil, Kanarese and Malayalam (English and Telugu editions published in 1936-37).	Free.		
(2) Conditions to be fulfilled for the grant of premium for breeding bulls.	Tamil, Telugu, Kanarese and Malayalam (English edition published in 1936-37).	Do.		
(3) The preparation of infant and invalid foods in the home from cholam.	English (re-printed) ..	Do.		
(4) Red hairy caterpillar pest.	English and Tamil ..	Do.		
(5) Natural incubation of poultry.	Tamil ..	Do.		
(6) Brooding and rearing of chicks.	Tamil and Kanarese ..	Do.		
(7) Housing of poultry ..	Malayalam ..	Do.		
(8) The mango hopper ..	English, Tamil, Telugu, Kanarese and Malayalam.	Do.		
(9) Care and management of cattle manure in South India.	Tamil, Telugu, Kanarese, Malayalam and English.	Do.		
(10) A short note on potato cultivation.	Tamil, Telugu, Kanarese and Malayalam.	Do.		

Subject.	Language in which published.				Price.
Leaflet series—cont.					
(11) Tamil songs on agriculture.	Tamil	..	..	..	Free.
(12) The earth scoop	English	..	..	..	Do.
(13) Preparation of turmeric for the market—A new polishing machine.	Do.	..	..	..	Do.
Broad Hint series—					
(14) Broad Hint No. 1. Feed your bullocks (reprint).	English	..	..	..	Free.
(15) Broad Hint No. 2. Feed your cow (reprint).	Do.	..	..	..	Do.
(16) Broad Hint No. 3. Plough early (reprint).	Do.	..	..	..	Do.
(17) Broad Hint No. 4. Plough efficiently (reprint).	Do.	..	..	..	Do.
(18) Broad Hint No. 5. Sow good seed (reprint).	Do.	..	..	..	Do.
(19) Broad Hint No. 6. Beware of weeds (reprint).	Do.	..	..	..	Do.
(20) Broad Hint No. 7. Feed and work your cow (reprint).	Do.	..	..	..	Do.
(21) Broad Hint No. 8. Dedication of breeding bulls of Ongole breed (reprint).	Do.	..	..	..	Do.
Pamphlet series—					
(22) Pamphlet No. 8. Coconut cultivation.	Tamil, Malayalam and Kanarese.				Free.
(23) Pamphlet No. 9. Uses of manure in the Madras Presidency.	Tamil, Telugu, Kanarese and Malayalam.				Do.
(24) Pamphlet No. 10. A note on Nilgiri Agriculture.	Tamil	..	..	..	Do.
Note series—					
(25) How to save temples and costly buildings from destruction.	English	..	..	..	Free.
(26) Inadequacy of dual purpose animal as the goal of livestock improvement in India.	Tamil, Telugu, Kanarese, Malayalam and English.				Do.

Press notes.

- (1) Malting of cholam as a cottage industry.
- (2) Agricultural Exhibitions.
- (3) Some improvements in paddy cultivation.
- (4) Coconut Nurseries and the selection of seedlings.
- (5) Sugarcane Cultivation in Tanjore district.
- (6) Green Manuring and application of phosphatic manures in Tanjore district.
- (7) The mahali disease on arecanuts—a warning to areca growers.
- (8) A superior cotton for the Tinnevely tract.
- (9) Compost making in municipalities.
- (10) Sindewah Furnace for turmeric boiling.
- (11) Persian Wheel Water Lifts.
- (12) Why a Pest Act is necessary for Cambodia cotton.

- (13) The place of money crops in Tanjore Delta.
- (14) Pine-apple—the prospect of the Modan lands of Malabar.
- (15) The coconut caterpillar.
- (16) Market surveys.
- (17) Mahali disease of arecanuts.
- (18) Tomato cultivation.
- (19) Eradication of nut grass—a troublesome weed.
- (20) Trials with Cotton in the second-crop season—Agricultural Research Station, Maruteru.
- (21) A short note on the cultivation of plums in the Nilgiris.
- (22) The preservation of cattle manure.
- (23) The protection of plants against disease.
- (24) The improvement in palm jaggery.
- (25) Cheap way of polishing turmeric.
- (26) Marketing survey of rice in Madras Presidency.
- (27) Marketing survey of groundnut in Madras Presidency.
- (28) Marketing survey of tobacco in Madras Presidency.
- (29) Marketing survey of potatoes in Madras Presidency.

VIII.—STATISTICS.

45. *Weekly cotton mill and press returns.*—There were 46 spinning mills during the year all of which continued to send their weekly returns of cotton received in their mills. Some of them had to be reminded often. Returns from the cotton presses and the Collectors of Customs were also received regularly every week.

46. *Crop cutting experiments.*—Most of the results of crop cutting experiments on the four main food crops of paddy, cholam, cumbu and ragi and on sugarcane conducted in 1936–37 were received during the year under report. After a preliminary examination of the results by the Agricultural Statistics Committee, the work of tabulation and statistical analysis was entrusted at the close of the year to the Statistical Officer attached to the Industries Department.

IX.—EXPENDITURE.

47. The receipts and expenditure for the year 1937–38 and the corresponding figures for the previous year are given below:—

Particulars.	1937–38.		1936–37.	
	RS.		RS.	
Expenditure	22,36,676	19,54,180		
Receipts	3,54,945	1,88,792		
Net expenditure	18,81,731	17,65,388		

From 1st April 1937 there was a change in the system of adjusting expenditure from grants received from the Indian Central Cotton Committee and the Imperial Council of Agricultural Research for the schemes sanctioned by them. The figures shown

against expenditure and receipts for 1937-38 include Rs. 1,41,923 the amount recoverable from the Indian Central Cotton Committee and the Imperial Council of Agricultural Research, etc. Excluding the expenditure on schemes, the slight increase in expenditure over that of 1936-37 is due to (1) the appointment of additional staff (Upper subordinates, store clerks, maistris) and special provision for equipment of depots. The increase in receipts is due to (i) the inclusion of the grants received from the Indian Central Cotton Committee and the Imperial Council of Agricultural Research on schemes financed by them, and (ii) the production of good seed material by bringing in more area under seed farm conditions and proper facilities that existed consequent on the opening of new depots and the appointment of store clerks.

X.—PROGRAMME OF WORK FOR 1938-39.

A. Chemistry.—Analytical and Advisory work will be continued as before.

Irrigation Research.—Chemical study of reaction of soil to irrigation will be taken up at Siruguppa.

Research on Soils.—Study of the method of estimation of electrical conductivity in South Indian Soils and standardization of the electrical conductivity method of estimation of salt content of soils and waters, factors affecting the pH. of soils and amelioration of alkaline soils.

Plant nutrition.—Influence of manuring on mineral composition of plantains, influence of potash manuring on keeping quality of plantains, stimulating effect of organic manure on crop quality and effect of manuring on the synthesis of protein in plants.

Animal nutrition.—Protein requirements for work, nitrogen partition of the urine of bullocks on different types of diet, mineral metabolism studies as per technical programme of the animal nutrition scheme.

Micro-Biology.—Studies in nitrogen fixation by azoto-bacter, studies on the fixation of nitrogen by Indian Legumes and effect of associated growth, photo-catalytic nitrification in soils, studies on groundnut nodule organisms, studies on the keeping quality of milk.

Sugarcane and jaggery work.—Continuation of the studies on the arrowing of cane and on the measurement of maturity on cane, study of non-sugar organic matter in cane juice, further studies on new materials in the preparation of active carbon, chemical studies of the development of colour in cream jaggery on keeping, white sugar from cane juice and palm juice by open pan process.

Malting of cholam.—Chemical tests on malted cholam, with the co-operation of the Director, Nutrition Research Institute, Coonoor, bio-chemical studies on the malted grains and malt foods, elaboration of technique of packing and storing malt foods, varietal tests in collaboration with the Millets Specialist.

Miscellaneous.—Biological value of cereals and pulses by the rat method, investigation of methods of prevention of citrus disease, microflora of sheep's gastro intestinal system.

B. Botany.—(a) Continuance of the survey and study of the morphological characters of the new varieties of Bananas.

(b) Continuance of survey of the indigenous fodder grasses.

(c) Floristic survey of South Kanara, Coorg and Tinnevely district.

C. Cereals.—(1) *Millets.*—Studies on the inheritance of characters in sorghum, varietal studies and selections for yield, improvement of the fodder value of cholam straw, striga resistance studies, comparative trials of the various millets (rainfed and irrigated varieties), evolution of short duration economic strain in ragi, classification of cultivated varieties of Korra, inheritance studies of Variga.

(2) *Paddy.*—Maintenance of purity and multiplication of Coimbatore strains so far evolved, survey and collection of wild varieties and species, yield trials of promising cultures, economic work by hybridization, cultural, manurial, seasonal and irrigation experiments, fundamental studies in characters, cytology and physiology, micro-chemical and histological study of the development of aleurone layer of rice grown under swamp and rainfed conditions.

(3) *Cotton.*—Continuation of studies on the performance of progenies of $U_4 \times Co_2$ in replicated rows, roguing the seed farm crops in Coimbatore district, study of water requirements of Cambodia cotton in pots and study of inheritance of characters.

Indian Central Cotton Committee Schemes.—Work on the schemes will be continued as per programmes approved by the Indian Central Cotton Committee.

(4) *Sugarcane.*—Meteorological studies, chemical studies, botanical study of germination, tillering, growth, thickness, weight, habit and arrowing, physiological study of root system and external characters of promising varieties, study of different methods of sampling, cultural and varietal studies, study of effect of different doses and different kinds of manure on cane, study of optimum dose of organic and inorganic nitrogen, study of fibre content and sugar recovery of promising canes and keeping quality of jaggery.

(5) *Fruits.*—Budding and grafting experiments, root stock trials, seed selection work on tomato, cape goose-berry and strawberry, import of new varieties of apples, plums and other fruit plants for trial, varietal trial of citrus and mango. Programme approved by the Imperial Council of Agricultural Research for the fruit scheme will also be carried out.

(6) *Root Crops.*—Trial of elephantiam under dry conditions, breeding and selection work on potatoes, study of botanical characters, comparative trials of promising varieties, evolution of new varieties by intervarietal and inter-species crosses, study of dormancy of potato tubers, keeping quality of potatoes, and trials with potato fertilizer mixture of different firms.

(7) *Oil-seeds*.—Varietal trials of groundnuts, comparative trials of selections, hybridization work (varietal and inter-specific), the study of the effect of climatic and soil variation on the commercial quality of the nut, manurial experiments, study of root systems and developmental studies, testing the duration of important selections, study of the varietal resistance to *Rhizoctonia* wilt, qualitative determinations of the varieties and selections, seed multiplication of strains and selections, comparative trials and hybridization work on castor and gingelly, manurial and cultural experiments on coconuts, study of progenies of economic crosses, investigation into the cause of button shedding, and qualitative determinations of the copra contents of nuts, and analysis for oil and free acid contents.

(8) *Spices and Narcotics*.—Isolation of different types in chillies for different shape with and without pungency and purity tests of promising selection of tobacco.

(9) *Miscellaneous*.—Study of different varieties of plantains and multiplication of promising varieties, sunnhemp fibre studies including cultural trials, comparison of the promising selections in greengram, trials of Pusa varieties of gogu and wheat, and trial of different varieties of soya beans.

Pulses.—Varietal selection and inheritance studies in lab-lab and cow-pea, comparison of the yields of the promising cultures of red gram, study of inheritance of seed coat colour, multiplication of seeds of strains 482 and 468 of Bengalgram.

Medicinal Plants.—Cultivation of medicinal plants like Jalap, Ipecacuahna, etc., will receive careful attention.

D. Entomology.—Study of pests on paddy, coconut, cotton, sugarcane, fruit trees, vegetables, stored products, castor, chillies, tobacco and apples, research on various aspects of bee-keeping, detailed study of freckled yellow disease of cholam, systematic studies on Acarina and Hymenopterous parasites of crop pests, experiments in the chemotrophic response of insects and trials of patent and indigenous insecticides.

E. Mycology.—Study of piricularia and helminthosporium of paddy and ragi, smut on cholam, mosaic disease of sugarcane, virus disease of tobacco, cotton, potato, tomato and brinjal, wilt on groundnut, mahali disease of arecanut, root-rot of nursery stock of citrus and soft rot of ginger.

F. Implements.—The programme outlined for 1937-38 will be continued.

G. Irrigation.—Study of the requirements of water for paddy, sugarcane and plantain will be continued.

H. Marketing.—Market surveys of Coconut, Grams, Sugars, Mustard and Rape, Cashewnut, Barley, Maize, Lac and Jute, Fish and Prawn, Extension of the Markets Act for Groundnut and Tobacco, Formation of Growers' Societies and Marketing associations, Grading of eggs, ghee and rice.

Agricultural Research Stations.

Anakapalle—Sugarcane.—Study of (1) variation in chemical composition chiefly Brix and sucrose, (2) difference, if any, in the chemical composition between arrowed and unarrowed canes, wrapped and unwrapped canes, (3) ripeness of different sizes and optimum period at which they should be harvested, and (4) length of period at which deterioration sets in after arrowing, study of germination, growth, root system and external characters, study of different methods of sampling, cultural, varietal and manurial trials, study of fibre content and sugar recovery and keeping quality of jaggery.

Paddy.—Multiplication of improved strains, Green manure experiments, varietal trials, growing of local varieties of dry paddy.

Ragi.—Trial of strains evolved by the Millets Specialist and multiplication of improved strains.

Other crops.—Multiplication of A.H. 25 and 45 (H.G. 1.) strains of groundnut, growing of Cambodia cotton, comparative trials of local jonna with strains received from Guntur, Hagari and Millets Specialist, trials of chillies, Korra and Ganti.

Demonstration of proper method of planting citrus trees, Apiculture, growing of fodder crops and supply of grafts (Mango and Orange).

Samalkota—Sugarcane.—Multiplication and comparison of promising varieties, study of varieties under restricted conditions, trial of different doses of nitrogen on cane varieties, effect of trench and bed planting on lodging of cane.

Paddy.—Study and comparison of selections, trial of varieties in the inter-season, study and purification of several units, study of the manurial and cultural experiments on paddy.

Plantains.—Study of different varieties, multiplication of promising varieties, trial of different doses of nitrogen separately and in combination with K_2O and P_2O_5 .

Other crops.—Varietal trials of greengram, chillies, etc., and sunnhemp fibre studies.

Poultry and apiculture.

Maruteru—Paddy.—Selection work, Hybridization, Mutation by vegetative propagation, Deep water paddy trials, cultural and manurial fumigation experiments.

Other crops.—Study on the varieties of sugarcane suitable to the tract, adopting of 'Sithakattu' season for planting, yield trials of cotton, trial of gingelly in the 'Pyrus' season, and multiplication and distribution of soya bean and pine-apples.

Guntur.—Continuation of the work under cotton, chillies, tobacco, gogu, peas, jonna, sajja, variga, maize, korra and groundnut.

Other crops.—Trial of bengalgram, gingelly, soya beans, coriander, teosinte, wheat, redgram, fruit plants and medicinal plants.

Side lines. Bee-keeping, poultry rearing, poudrette preparation, making of composts under Indore method, hay-making and silage.

Buchireddipalayam.—Study and trial of varieties of paddy, selection work in local varieties, study of hybrid cultures, isolation of blast resistant cultures in Molakolukulu. Experiments to find the effect of planting different ages of seedlings.

Kodur Fruit Research Station.—Collection of material for varietal trials of strains of mango, taxonomical studies for classification and nomenclature, study of root systems of oranges, budding or grafting of seedlings of poly-embryonic races of mango to selected individual trees of some varieties for a preliminary study of these as rootstocks to mangoes and survey of citrus and mango orchards in the Presidency.

Hagari—Cotton.—Comparative trial of both exotic and local varieties with H. 1 cotton.

Jonna.—Comparison of Bombay varieties with local selections.

Other crops.—Selection work on korra, ragi, safflower, bengalgram and sajja.

Side lines.—Research on Soil Physics in relation to dry farming problems of black soil.

Nandyal.—Selection work on cotton, cholam and korra and comparison of the promising types.

Other crops.—Trial of soya beans, bengalgram, groundnut, redgram and lupins.

General work.—Intensive study of manufacture of composts and the value of different forms of live fencing.

Gudiyattam—Sugarcane.—Study will be continued on the same lines as done at Anakapalle.

Other crops.—Multiplication of improved strains of paddy, ragi, cholam, cumbu, groundnut and gingelly. Growing of chillies, gam, colocasia, etc.

General.—Poultry rearing, preservation of farm-yard manure, composting of cane trash, use of improved implements.

Palur—Sugarcane.—Varietal trials, spacing experiments, planting cane monthwar, multiplication of setts by short crop method, preparation of activated carbon and manufacture of cream jaggery.

Paddy.—Multiplication of important strains suitable to the circle, selection work, study of water requirements, bone meal optimum dose experiment.

Other crops.—Selection work on ragi, cumbu, tenai and growing of vegetables.

General.—Poultry breeding, apiculture and composting as per Indore method.

Aduturai—Paddy.—Multiplication and distribution of bulk strains, comparative trials, growing of different varieties for purification and study, manurial and cultural trials.

Other crops.—Growing of green manure crops, plantains, sugarcane, soya bean, turmeric, cotton, vegetables and fruit trees.

Side lines.—Poultry rearing, Bee-keeping and Pisciculture.

Pattukkottai—Paddy.—Trial of Coimbatore and Aduturai strains as single crop samba and as second crop in double crop area, manurial trials on paddy.

Other crops.—Trial of ragi, sugarcane, turmeric, plantains, groundnut and cotton.

Koilkatti—Cotton.—Irrigation experiments, trial of promising varieties.

Cholam.—Trial of irrigated and unirrigated varieties.

Other crops.—Cultivation of cumbu, ragi and tenai, selection work on blackgram and coriander.

Side lines.—Poultry breeding.

Ambasamudram.—Survey of the paddy areas and collection of paddy varieties, study of the local and improved promising varieties. Inter-varietal trials and introduction of suitable green manure crops.

Pattambi—Paddy.—Selection, hybridization and mutation work. Cultural and manurial trials.

Other crops.—Work on sugarcane, pine-apples, cotton, samai, ragi and groundnut.

Taliparamba.—Study of the varieties of sugarcane, plantains, ginger, chillies, ragi and arecanut, manurial requirements of pepper, study of fruit plants and growing of catch crops in the coconut areas.

Bee-keeping, Poultry breeding and Pisciculture.

Nanjanad—Potatoes.—Study of Botanical characters, identification and classification of potato varieties, comparative trials of promising varieties, row yield trials of new varieties and manurial and irrigation experiments.

Other crops.—Work on korali and samai, trials of pusa types of barley, oats and wheat, trials of fodder grass, legumes and hybridization work on lupins.

General.—Goat and sheep breeding, study of Apiculture.

Trial Plots.

First Circle.—Cultural, varietal and manurial trials pertaining to paddy, sugarcane, ragi, groundnut and jonna.

Second Circle.—Trial of new strains and exotic varieties of cotton, korra, jonna compared with approved local strains.

Third Circle.—Trial of cotton strains like Nos. 920 and 1267 and KPT. 4714, 6142 and 6133, trial of groundnut, tobacco and green manure seeds, periamanjil versus local irungu cholam, trial of samba and kona-kuruvai paddy strains and trial of ragi, bengalgram and redgram.

Fourth Circle.—Trial of improved strains of paddy produced at Pattambi and the bulk strains of Taliparamba, trial of different varieties of sugarcane in the factory area at Kalianpur. Trials of improved pusa strains of wheat and barley and H. 22 ragi, and potato varieties in the Nilgiris, further trials of Uganda Cambodia hybrids in the Coimbatore district. Trials of improved varieties of millets, groundnut, gingelly and bengalgram.

Demonstration.

(1) *Crops.*—Successful strains of paddy, millets, oil seeds, sugarcane, cotton, potatoes, lucerne, coconuts and onions, encouraging thin nursery and economic planting to effect saving in the seed and improvement in the yield. Planting of sugarcane in lines wide apart, intercultivation with bullock power, advice on the importance of roguing and clean cultivation, extension of areas under various crops and supply of fruit plants.

(2) *Implements.*—Introduction of improved ploughs, guntakas, junior hoes, chaff-cutters, buck-scrapers, bund-formers, pruning setts, scrapers, roll easy mhote wheels, water lifts and improved mills.

(3) *Manures.*—Demonstration of improved methods of conservation of cattle manure, composting of organic waste material as per Indore process, introduction of green manure crops as daincha, indigo and sunnhemp, conservation of urine in stall by addition of dry earth or any vegetable compost, preparation of poudrette, use of concentrated manures and chemical manures.

(4) *Seed supply.*—Seed farm work will be continued to arrange for a pure seed supply of improved varieties of various crops suitable to each locality.

(5) *Jaggery manufacture.*—Preparation of activated carbon, economic method of preparing good jaggery by the use of Sindewahe furnaces, manufacture of cream jaggery and white sugar with centrifugal machines.

(6) *Pests and diseases.*—Investigation of the various crop pests and diseases and demonstration of remedial measures such as spraying, dusting and fumigating.

(7) Exhibitions on festive occasions, distribution of departmental publications and sale of implements, and advice and general propaganda on Agricultural matters.

(8) Formation of Agricultural associations and Co-operative loan and sale societies.

I have the honour to be,

Sir,

Your most obedient servant,

P. H. RAMA REDDI,
Director of Agriculture.

GLOSSARY.

Apple	<i>Pyrus malus.</i>
Arecanut	<i>Areca caticha.</i>
Barley	<i>Hordeum vulgare.</i>
Bengalgram	<i>Cicer arietinum.</i>
Blackgram	<i>Phaseolus mungo var. Radiatus, hook.</i>
Brinjal	<i>Solanum melongena.</i>
Buchu	<i>Barosma betulina.</i>
Carrots	<i>Daucus carota.</i>
Cashewnut	<i>Anacardium occidentale.</i>
Castor	<i>Ricinus communis.</i>
Chillies	<i>Capsicum sp.</i>
Cholam	<i>Sorghum vulgare.</i>
Coconut	<i>Cocos nucifera.</i>
Cotton	<i>Gossypium.</i>
(i) Cambodia cotton	<i>Gossypium hirsutum.</i>
(ii) Karunganni cotton	<i>Gossypium indicum.</i>
(iii) Uppam cotton	<i>Gossypium herbaceum.</i>
(iv) Pulichai cotton	<i>Gossypium neglectum.</i>
(v) Westerns cotton	} Mixture of <i>Gossypium herbaceum</i> and <i>indicum.</i>
(vi) Northern cotton	
(vii) Roseum cotton	<i>Gossypium var. Rosea, watt.</i>
(viii) Nadam cotton	<i>Gossypium var. Nadam, watt.</i>
Coriander	<i>Coriandrum sativum.</i>
Cowpea	<i>Vigna catieng.</i>
Cumbu	<i>Pennisetum typhoideum.</i>
Dhaincha	<i>Sesbania aculeata.</i>
Elephant grass	<i>Pennisetum purpurea.</i>
Field beans	<i>Dolichos lablab.</i>
Figs	<i>Ficus carica.</i>
Gingelly	<i>Sesamum indicum.</i>
Ginger	<i>Zingiber officinale.</i>
Grape-vine	<i>Citrus decumana.</i>
Greengram	<i>Phaseolus mungo.</i>
Groundnut	<i>Arachis hypogæa.</i>
Guinea grass	<i>Panicum maximum.</i>
Indigo	<i>Indigofera sumatrana.</i>
Jalap	<i>Ipomea purga.</i>
Kolingi	<i>Tephrosia purpurea.</i>
Kollaganjeru	<i>Ipomea hispida.</i>
Kolukkattai grass	<i>Pennisetum cenchroides.</i>
Korra	<i>Setaria italica.</i>
Lime	<i>Citrus acida.</i>
Linseed	<i>Linum usitatissimum.</i>
Lucerne	<i>Medicago sativa.</i>
Maize	<i>Zea mays.</i>

Mangoes	<i>Mangifera indica</i> , linn.
Mangosteen	<i>Garcinia mangostana</i> .
Oats	<i>Avena sativa</i> .
Onions	<i>Allium sativum</i> .
Oranges	<i>Citrus aurantium</i> .
Paddy	<i>Oryza sativa</i> .
Panivaragu	<i>Panicum miliaceum</i> .
Palmyra	<i>Borassus flabellifer</i> .
Pears	<i>Pyrus communis</i> .
Pepper	<i>Piper nigrum</i> .
Phillipesara	<i>Phaseolus trilobus</i> , ait.
Pineapple	<i>Ananas sativa</i> .
Plantain	<i>Musa sapientum</i> .
Plums	<i>Prunus salicina</i> .
Potato	<i>Solanum tuberosum</i> .
Radish	<i>Raphanus sativas</i> , linn.
Ragi	<i>Eleusine coracana</i> .
Redgram	<i>Cajanus indicus</i> .
Royal Palm	<i>Oreodoxa regia</i> .
Safflower	<i>Carthamus tinctorius</i> .
Samai	<i>Panicum miliare</i> .
Sapota	<i>Achras sapota</i> .
Soya beans	<i>Glycine soja</i> .
Strawberries	<i>Fragaria vesca</i> .
Sugarcane	<i>Saccharum officinarum</i> .
Sunnhemp	<i>Crotalaria juncea</i> .
Tapioca	<i>Manihout utilissima</i> .
Tenai	<i>Setaria italica</i> .
Teosinte	<i>Euchlaena mexicana</i> , schrad.
Tobacco	<i>Nicotiana tabacum</i> .
Tomato	<i>Cyphomandra betacea</i> .
Travellers' tree	<i>Ravenala madagascariensis</i> .
Tung oil plant	<i>Aleurites fordii</i> .
Turmeric	<i>Curcuma longa</i> .
Variga	<i>Panicum miliaceum</i> .
Water hyacinth	<i>Eichhornia crassipes</i> , Solms.
Wheat	<i>Triticum spp.</i>

Government of Madras

DEVELOPMENT DEPARTMENT

G.O. No. 2641, 24th October 1938

Agriculture—Administration Report for 1937-38—Recorded with remarks.

Order—No. 2641, Development, dated 24th October 1938.

Recorded.

2. The most important events in the Agricultural department during the year under review were the reorganization or regrouping of circle charges, reducing their number from eight to four and increasing the number of District officers (Assistant Directors) from 10 to 13 and the transfer of control over livestock improvement work to the Veterinary department. The former was effected with a view to securing economy in expenditure while the latter was ordered mainly on the ground that the Veterinary department has a staff trained not only to attend to diseases of animals but also in their care and maintenance and therefore fully equipped for control of livestock work and for carrying out measures for its further development without much additional cost. Another event of far-reaching importance on which, however, orders were issued only after the close of the year was the re-amalgamation of the teaching section and the research section of the Coimbatore Agricultural College. For the past twelve years teaching and research were carried on practically in water-tight compartments with the result that the teachers and the taught were not in touch with the researches actually in progress in the research section. The re-amalgamation now ordered remedies this defect and has also reduced the cost of the college as a whole by a little over Rs. 18,000 per annum.

3. Agricultural education both in the college and outside continued to be imparted on the usual lines. The scheme initiated in 1936-37 for affording facilities for practical training in agriculture for the educated unemployed was also continued during the year, though only on a restricted scale. Of the 60 candidates selected for admission only 34 completed the course. The remaining 26 either did not join or left the course after joining. Several reasons have been adduced in explanation of the lack of enthusiasm on the part of young men to take to the course. These are now under examination. The short course in fruit culture and nursery practices started at the Fruit Research Station, Kodur, was a novel feature introduced during the year under review. The course was run for six months and 13 students and 3 agricultural subordinates went through the training.

4. Several items of research engaged the attention of the research workers during the year. The Chemistry Section was as usual busy with the analysis of samples of soils, manures, animal foodstuffs and fodders, water for irrigation purposes, human foods for jails and hospitals and other agricultural produce for the public and Government departments. The soil survey of the Gundlakamma project was completed during the year and further investigations into the soils of the Tungabhadra area continued. Experiments in animal nutrition and on mineral metabolism of dairy cows were continued and some interesting results recorded in respect of the relation between work turned out by and the protein requirements of working bullocks. Several samples of indigenous grasses were analysed for their mineral content and Kollukattai and Rhode grasses were studied for response to manuring. Investigation into the malting of cholam which was undertaken with the help of a grant from the Imperial Council of Agricultural Research was concluded at the end of the year and further investigations are in progress in regard to the marketing aspects of the malt.

The Systematic Botany Section collected as many as 170 species of grass and has under trial the most promising of them. It is hoped that these investigations will prove useful to the special officer whom the Government have just appointed to carry out a survey of the grazing facilities available in the country and to improve them to the best advantage of the ryot.

Several new varieties of cholam were studied at the Coimbatore, Hagari and Nandyal stations. In view of the importance of providing straw for cattle, especially in areas where grazing is scarce, the improvement of grain as well as of straw is aimed at. Strain A.S. 3355 which has been found to be very satisfactory in all respects is proposed to be given field-scale trials at Coimbatore and Erode. Ragi is receiving attention at Erode, Anakapalle and Hagari.

Improved varieties of paddy were released from the Agricultural Stations at Coimbatore, Aduturai and Pattambi under the names of Co. 2, MTU. 12 and MTU. 13, PTB. 3 and PTB. 4. Kuruvai No. 5905, which gave 27.8 per cent higher yield than the standard at Aduturai and proved satisfactory in district trials will be released to the cultivator in the next season as ADT. 16. Tests made in hybridization between C.O.₃ and a Burma variety which gives high yield as well as stiff straw and three other strains resistant to paddy blast gave promising results. At Pattambi it was found that the application of sulphate of ammonia as a top dressing gave 40-60 per cent increased yield over unmanured crop and that neem cake gave lower yield than groundnut or castor cake. At Aduturai the application of molasses at two tons per acre was found to give a higher yield but without any residual effect on the succeeding crop. Four tons per acre were however found to have some effect.

In the Cotton section, Co. 2, the most popular strain in Cambodia, is still found to suffer from many defects such as later maturity, susceptibility to the stem weevil and coarseness of fibre. Two of the subsequent Cambodia strains, 920 and 1267 have given better results than Co. 2; in fact strain 920 is expected to replace Co. 2 soon. As further improvement in Cambodia does not appear to be possible by pure line selection greater attention is now being paid to hybridization. In hybridization, simple crossing between different species having proved disappointing, the use of imported quality cotton is under examination and there appears to be some prospect of Uganda crosses being found suitable for Coimbatore conditions.

The Cotton section has also under its control four useful schemes financed by the Indian Central Cotton Committee. The fodder cholam scheme was closed down during the year but in its place a new Mungari cotton breeding scheme was inaugurated at Adoni. In the Herbaceum scheme, the plan of work by single plant selection having failed, improvement of the Uppam strain by hybridization was resorted to and a large amount of useful material obtained. It is unfortunate however that the committee decided to discontinue the scheme after the expiry of its sanctioned term on 31st May 1938. The botanical work under the Pempheris and Physiological Scheme has yielded a few promising strains from crosses between Co. 2 and three South American varieties which are resistant to the weevil attack. A few varieties resistant to shedding have also been obtained from Karunganni. Some useful results were also recorded under the entomological side of the work. Trials in evolving an annual type from the nadam strain have not made much headway during the year owing to the season having once again been found to be disappointing. The object of the Mungari scheme is to breed medium stapled strains which can replace the inferior local varieties. A large number of single plant selections are reported to have already given encouraging results. A small scheme for the investigation of sunn-hemp also financed by the Imperial Council of Agricultural Research was commenced during the year at Samalkota and a preliminary study of the characters of the local varieties is in progress.

Research work on groundnut, castor, gingelly, coconut and cashewnut was continued with the triple object of securing higher yield, improved quality and reduction in the cost of production. A large number of selected varieties of groundnut are under trial at the groundnut station, Erayanur (South Arcot) and of these No. 678 was found to have yielded more than A.H. 25, the present popular strain, and also to be superior in shelling percentage and weight. Promising varieties have been selected in castor and gingelly and have been carried forward for further trial. Experiments on the usual lines were also conducted on coconut. The Government have after the close of the year sanctioned with the help of a grant from the Imperial Council of Agricultural Research

a scheme for intensive studies on coconut similar to that which is being done on groundnut in South Arcot and the work will soon be started at Kasaragod.

5. Comparative trials of different varieties of sugarcane under varying conditions are carried on at Anakapalle and its sub-station, Gudiyattam and to a smaller extent at Samalkot and Palur. At Gudiyattam and Anakapalle, the work is financed by the Imperial Council of Agricultural Research. At the former place, varietal experiments were continued with restricted and normal supply of irrigation and manure and it was found that under restricted conditions Co. 213 gave the highest yield closely followed by Co. 243. Under normal conditions striped Mauritius gave the lowest while Co. 408 and Co. 419 yielded the highest. At Anakapalle, different varieties of cane were tested for their yield, for their behaviour generally and under water-logged conditions. Various methods of preserving sugarcane for planting including the local practices and those obtaining in Ceded districts and the North West Frontier Province were tried. Experiments were also conducted on the ripeness of canes.

The Government are most anxious that the extent under improved varieties of cane of varying maturity should show an appreciable increase in the province more particularly in the neighbourhood of existing sugar factories and that the ryot should thus be enabled to participate to an increasing degree in the benefits of protection now afforded to the sugar industry. The sugar factories in Madras can hold their own against their longer established competitors up in the north only if they can secure cane at a cheaper cost and for an extended period and this will be possible only if the ryot can be helped to obtain a larger yield at lesser cost of improved varieties of cane suitable to each locality but grown at times which would permit of well-regulated harvest to keep the factory fed for an extended working season and if this is done, the ryot can always be certain of securing fairer prices than he now does for his cane. With a view to bringing about these desired results the Government during the year under review sanctioned organization in factory areas of co-operative societies subsidized out of the Government of India grant from the Sugar Excise Fund for introducing and growing varieties of cane best suited to the locality and the factory at cheaper cost. The Government trust that by the time the scheme of subsidy which extends to five years is worked out, sugarcane growing in the province would be completely revolutionised.

6. The potato farm at Nanjanad was originally started for growing disease-free potatoes of good varieties for distribution to ryots for seed purposes, for experimenting with different kinds of manures in order to find out the best manure suitable for the Nilgiris and for carrying out experiments with green manures and rotation of crops and generally for encouraging cultivators to grow better varieties and adopt up-to-date methods of cultivation. Great

Scot which is now so popular in the Nilgiris owes its origin to the work carried on at the station. A new scheme of research partly financed by the Imperial Council of Agricultural Research has been at work at Nanjanad from the year 1933, with the object of studying exotic and indigenous varieties of potato with particular reference to their suitability to conditions in the Nilgiris, the keeping quality of tubers, methods of storage, etc. During the last five years a number of crosses have been raised at the station some of which were found to be superior even to Great Scot. Manurial tests established the superiority of what has come to be known as the Nanjanad mixture over proprietary mixtures sold as potato manures, in cheapness, higher yield and other features like residual effect on the succeeding crop. The sanctioned period of the scheme expired shortly after the close of the year under review. But as a number of problems remains to be investigated, it is proposed to continue research on an intensive scale for another period of five years. A scheme of work has been drawn up for the purpose to be carried out with the help of a grant from the Imperial Council of Agricultural Research.

7. The fruit station at Anantarakupet has awakened the fruit growers to the need for scientific fruit farming. More than 4,000 citrus plants have been distributed from the station to the public. The station is also engaged in finding suitable stock for budding of oranges and limes. Results useful to fruit growers have been obtained in trials for improving the technique of bud-insertion, as to the best time of lopping the stocks after budding, and the best season for budding. A detailed study of root stocks is in progress and the station has under trial about 70 varieties of reputed citrus obtained from all over India and America. About 100 varieties of choice mangoes have also been collected and are under trial. Till recently it was believed that Indian mango produces only one seedling. The station has discovered about 12 types which produce as many as four seedlings. This is of very great importance in raising uniform stock and for achieving standardized quality of crop production. The best methods of sowing mango stones for raising plants for grafting have also been found by trials. The art of root grafting mango has also been evolved successfully and other methods were discovered for propagation of mango with reduced cost. Investigations are also in progress in private gardens to find out the cause of 'mango crop failures' that frequently occur in the Presidency. Work on other fruits like sapotas, grapes, pomegranates, figs and papayas has also been undertaken. A fruit nursery has been sanctioned for Kodur and another for Tali-paramba after the close of the year for carrying out systematic work in growing fruit stock for propagation purposes in order to satisfy the increasing demand from the public for reliable parent plants and to help in the establishment of more private nurseries.

8. The quiet work of the plant pathologists (the Entomologist and the Mycologist) even though it embraces all crops seldom catches the public eye except when pests and diseases actually

begin their ravages and it is not always possible to suggest effective remedies the moment such pests or diseases make their appearance. The work done by them during the year is set forth in paragraph 23 of the Director's report.

9. The Research Engineer's section continued its work in designing, testing and improving agricultural implements and machinery. Plough Cooper No. 34 which is found to be cheaper and better than the popular model, Cooper No. 11, is under manufacturing trials by Messrs. P.S.G. & Sons Charity Industrial Institute, Peelamedu. The light ridge plough designed by the Agricultural Engineer and produced by all the leading agricultural implement manufacturers in India have been so well received that no less than 235 ploughs of this design were sold during the past one year. The total number of iron ploughs sold during the year reached the figure of 4,339 as against 3,000 last year of which only 86 were imported ones. A simple bullock-drawn implement for furrowing has been designed and is under test. It is expected that this implement will be useful in conserving soil moisture by furrowing. A disc roller for applying green manure to paddy lands was designed at Aduturai station and is under test in the workshop at Coimbatore. In Agricultural Engineering, research has in fact outstripped manufacture and as considerable difficulty has been experienced in getting private workshops manufacture according to the design of the Agricultural Engineer proposals are now under the consideration of Government for the establishment of an Agricultural Implement section in the Industrial Engineering Workshop.

10. There were as many as 1,026 'trial' plots during the year under paddy, ragi, sugarcane, cotton, cholam, tenai and tobacco as against 902 in the previous year and 7,963 demonstration plots as against 7,554. Besides, a large number of demonstrations improved implements, methods for preservation of farm-yard crop manures, control methods against diseases and pests were conducted. The maistris under the special scheme of demonstration propaganda in the Vizagapatam district carried out intensive propaganda in 360 villages while in respect of particular improvements it was extended to 948 villages. There were 3 exhibitions in 1937-38 as against 299 in the previous year. farmer's day was also arranged at the Agricultural Research Station, Hagari, when cultivators were shown round the experiments conducted at the farm. At the rural exhibitions held Tritala (Malabar district) prizes were awarded for the best methods of agricultural improvements and products exhibited at the show.

11. Marketing surveys have been completed and final reports submitted in respect of 21 commodities. Besides these, the Marketing section carried out a number of special investigations and supplied information to the public in regard to market intelligence and statistics. The work of fixing grade standards for various products like tobacco, groundnut, ghee, barley, etc.

jaggery, wool and hair is in progress. A good quantity of Virginian tobacco was graded and shipped by the Indian Tobacco Association, Guntur, the quality of which attracted the attention of English cigarette manufacturers. The Fruit Growers' Society, Kodur, certain other societies organized for fruit growers at Vizianagram and at Puttur, the Grape Growers' Society at Michaelpalayam (Madura district), the Pineapple Growers' Society at Tellicherry and the Central Egg Marketing Society newly organized at Chinnaganjam (Guntur district) have done useful service to their members in helping them to market their produce. Special freight rates were granted by the Railway for transport of bananas from Northern Circars and as a result the traffic in them has increased. The Railway Board has been addressed for similar concessions in regard to transport of betel leaves to Northern India. In the case of pineapples the Railway refused to grant concessional rates.

12. As in the previous year, co-operative societies, especially Loan and Sale Societies, continued to give their assistance to ryots, granting loans on the pledge of produce, in the disposal of produce of its members and in the distribution of pure seed, noteworthy instances being the Loan and Sale Societies at Anakapalle, the Central Society at Cuddalore, the Lalgudi Sivagnanam Society, the Tiruppur Society and the Vallam (Tanjore) Society which has undertaken to distribute groundnut seed under seed-farm conditions. An Agricultural Improvement Society was registered in Ammanar (North Arcot) and an Agricultural Colonization Society at Avadi during the year. The Agricultural Associations also continued to do useful work particularly in arranging exhibitions and shows. Nine new associations were started during the year, two in South Arcot, one in North Arcot and six in Tinnevely district.

13. The Tiruppur Cotton Market Committee constituted under the Madras Commercial Crops Markets Act continued to do useful work for the trade. The Government propose to extend the Act to South Arcot in respect of groundnut and to Guntur and Kistna (Bezwada taluk) for regulation of the tobacco market. With a view to bringing the activities of the department to the notice of ryots and the interested public as early as practicable, the Government recently issued instructions for the publication of short notes in English and in the principal languages of the Province and publicity of this kind has now become a regular feature of the department's work. During the year under review, 29 such notes on various subjects were issued besides several leaflets and bulletins published periodically.

14. Towards the close of the year the Government prescribed a minimum period of touring and a minimum period of halts during tours for Assistant and Deputy Directors and it is hoped that District officers will be enabled to get into closer touch with

8 No. 2641, DEVELOPMENT, 24TH GOVT. 1957

ryots. Orders were also issued after the close of the year for periodical review of the research programmes drawn up by various sections and for their co-ordination especially with view to securing practical benefits to agriculture.

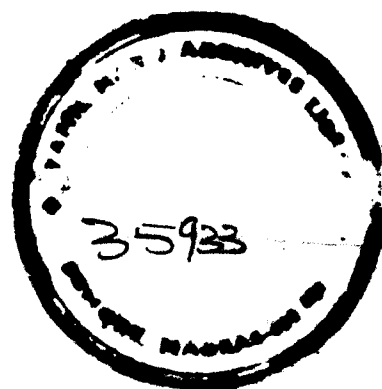
(By order of His Excellency the Governor)

C. J. PAUL,
Secretary to Government

To the Director of Agriculture.

- " Director of Veterinary Services.
- " Registrar of Co-operative Societies.
- " Education and Public Health Department.
- " Public Works Department.
- " Public Department.
- " Accountant-General, Madras.
- " Government of India, Department of Education, Health and L.
- (with C.L.).

Press.



R
J. 21118N37
N38:2

65
RC

N

RF
6

8.3075

AGENTS FOR THE SALE OF MADRAS GOVERNMENT PUBLICATIONS

IN INDIA.

NEW BOOK CO., Booksellers, 'Kitab Mahal,' 188-90, Hornby Road, Bombay.
D. B. TARAPOREVALA SONS & CO., Bombay.
THACKER & CO. (LTD.), Bombay.
N. S. WAOLE, Circulating Agent and Bookseller, No. 6, Tribhuvan Road, Girgaon, Bombay.
THE BOOK COMPANY, Calcutta.
BUTTERWORTH & CO. (LTD.), 6, Hastings Street, Calcutta.
R. CAMBRAY & CO., Calcutta.
THACKER, SPINK & CO., 3, Esplanade East, Calcutta.
B. S. MATHUR & CO., Chatur Vilas, Pasta Civil Lines, Jodhpur (Rajaputana).
The Proprietor, THE PUNJAB SANSKRIT BOOK DEPOT, Saldmtha Street, Lahore (Panjab).
THE CHRISTIAN LITERATURE SOCIETY FOR INDIA, Post Box No. 501, Park Town, Madras.
CITY BOOK COMPANY, Post Box No. 283, Madras.
C. COOMARASWAMY NAIDU & SONS, 27 and 35, Chinnathambi Street, Madras.
HIGGINBOTHAMS (LTD.), Mount Road, Madras.
THE LAW PRINTING HOUSE, 11, Mount Road, Madras.
G. A. NATESAN & Co., Madras.
P. R. RAMA IYER & Co., 368, Esplanade Row, Madras.
P. VARADACHARI & Co., Booksellers, 8, Linga Chetti Street, Madras.
Agent, THE SOUTH INDIA SAIVA SIDDHANTHA WORKS PUBLISHING SOCIETY, LTD., 6, Cera Merchant Street, Madras.
D. SREE KRISHNAMURTHI, Editor of "Grantha Paripalana," Ongole (Madras).
E. M. GOPALAKRISHNA KONE, Pudumantapam, Madura (Madras).
M. SESHACHALAM & Co., Proprietors, The Hindu Press, Masulipatam (Madras).
THE HINDUSTAN PUBLISHING CO., LTD., Rajahmundry (Madras).
THE MODERN STORES, Salem (Madras).
The Proprietor, THE HOUSE OF KNOWLEDGE, Booksellers and Publishers, Pallagraharam P.O., Tanjore (Madras).
S. KRISHNASWAMI & Co., Teppakulam Post, Trichinopoly (Madras).
L. VAIDYANATHA AYYAR, Law Bookseller, Teppakulam P.O., Trichinopoly (Madras).
A. VENKATASUBBAN, Law Bookseller, Vellore (Madras).
P. N. SWAMINATHASIVAN & Co., Commission Agents, Booksellers, etc., Pudukkottai State.
MOHANLAL DOSSABHAI SHAH, Books Agent, etc., Rajkot.
K. KRISHNA AYYAR BROTHERS, Booksellers, Publishers etc., The Round, Trichur (Cochin State).
THE BOOKLOVERS' RESORT, Booksellers and News Agents, Talikad, Trivandrum.

NOTICE.

Official publications may be obtained in the United Kingdom either direct from the office of the High Commissioner for India, India House, Aldwych, London, W.C. 2, or through any bookseller.