Report on the Operations of the Department of Agriculture Madras Presidency for the Year 1936-37

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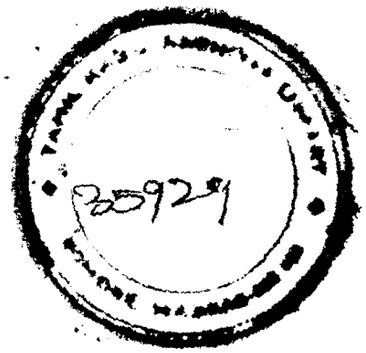

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OFFICE OF THE DIRECTOR OF AGRICULTURE,
MADRAS, *dated the 26th July* 1937.

From

M.R.Ry. RAO BAHADUR D. ANANDA RAO GARU, B.SC.,
Director of Agriculture,
Madras,

To

THE SECRETARY TO GOVERNMENT,
DEVELOPMENT DEPARTMENT,
Fort St. George, Madras.

SIR,

[Administration Report—Agricultural Department—1936-37.]

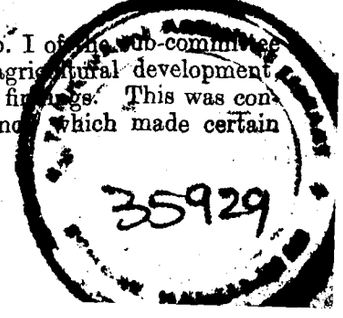
I have the honour to submit the report on the operations of the Department of Agriculture for the year 1936-37.

I.—ADMINISTRATION.

2. I continued to be in charge of the department throughout the year under report.

3. The year under review has been an eventful one. The visit of Sir John Russell, D.SC., F.R.S., Director, Rothamsted Experimental Station, and Dr. N. C. Wright, PH.D., Director, Hannah Dairy Research Institute, Ayrshire, to examine the research schemes that are being run throughout the country under the auspices of the Imperial Council of Agricultural Research made it necessary that a detailed stock should be taken of the research activities of the department during the last 15 years. On the side of propaganda and demonstration, orders of Government Ms. No. 125, Development, dated the 16th January 1937, rendered it possible to bring out a popular account of the department's activities covering a period of 13 years. The book is in the press and is expected to be released shortly.

As a convener of the sub-committee No. I of the sub-committee of the Provincial Economic Council for agricultural development I submitted to Government a report on its findings. This was considered by the Provincial Economic Council which made certain definite recommendations.



Report on the operations of the department of Agriculture Madras presidency 1936-37.

Government in their Memorandum No. 1921-I/36-I, dated 9th May 1936, ordered that in view of a need for economy, proposals for retrenchment of expenditure should be submitted. Carefully considered and detailed proposals have been submitted to Government on which orders are awaited.

The question of livestock improvement loomed large in our programme of work. His Excellency the Viceroy's circulars received very careful attention and proposals are under way to give effect to the policy enunciated in those circulars.

During the year, I attended the meetings of the Irrigation Development Board, Advisory Board of the Imperial Council of Agricultural Research, Animal Husbandry Wing, Provincial Marketing Board, Road Development Board, Provincial Economic Council and Advisory Committee of the Madras and Southern Mahratta and South Indian Railways.

Leave, transfer, appointment, confirmation, etc.

4. (a) *Indian Agricultural Service.*—Mr. R. C. Broadfoot, Principal, Agricultural College, Coimbatore, went on leave for six months and 25 days from 30th May 1936. Mr. R. W. Littlewood, Deputy Director of Agriculture, Livestock, officiated as Principal till 1st November and from that date he was placed on special duty for two months to select sites for two new cattle-breeding stations. During this period, Mr. D. G. Munro, Deputy Director of Agriculture, VIII Circle, officiated as Principal. Mr. Munro proceeded on leave from 4th January 1937 which will expire on 31st July 1937. He has since applied for extension of leave and orders are awaited. Rao Bahadur S. Sundararaman, Government Mycologist, retired from service on 7th November 1936.

(b) *Madras Agricultural Service.*—There were several changes in the Madras Agricultural Service. Two officers, Rao Sahib Mr. C. Narayana Ayyar, Headquarters Deputy Director of Agriculture and Mr. C. V. Sesha Acharya, Assistant Director of Agriculture, Madura, retired from service from 16th November 1936 and 12th March 1937, respectively. Mr. K. T. Alwa, Deputy Director of Agriculture, VII Circle, Tellicherry, succeeded Mr. Narayana Ayyar as Headquarters Deputy Director of Agriculture, and Mr. V. T. Subbayya Mudaliyar, farm manager, central farm, succeeded Mr. Sesha Acharya as Assistant Director of Agriculture, Madura. Mr. Alwa's place at Tellicherry was filled by Mr. K. Unnikrishna Menon and the latter was succeeded by Mr. C. Ramaswami Nayudu as Deputy Director of Agriculture, VI Circle, Madura. During the absence of Mr. D. G. Munro on leave, Mr. Y. G. Krishna Rao Nayudu was appointed as Deputy Director of Agriculture, VIII Circle, Coimbatore. Consequent on the retirement of Mr. S. Sundararaman, Mr. K. M. Thomas was appointed as Government Mycologist on probation. Mr. S. Sitarama Patrudu, Superintendent, Agricultural Research Station, Anakapalle, was granted leave from 9th November 1936, and on

the expiry of his leave he was posted as Assistant Director of Agriculture, Vellore. His services have been in the meantime lent to Vuyyuru Co-operative Industrial and Credit Society for a period of three years. His place at Anakapalle was filled by Mr. M. Kanti Raj Nayudu, Assistant Director of Agriculture, Vellore. The special post of Assistant Director of Agriculture created to assist the Deputy Director of Agriculture, VIII Circle, for work connected with the Lower Bhavani scheme having terminated on 31st December 1936, Mr. A. Chinnathambi Pillai who had held the temporary post was transferred to Vellore as Assistant Director of Agriculture. The services of Mr. K. Ramayya, Paddy Specialist, were lent to the Institute of Plant Industry at Indore for a period of two and a half years from 10th February 1937, for appointment to the post of Geneticist and Botanist and in the consequential arrangement Mr. C. R. Srinivasa Ayyangar, Superintendent, Agricultural Research Station, Pattambi, was appointed as Officiating Paddy Specialist and Mr. S. Dharmalinga Mudaliyar, Assistant in Paddy, Coimbatore, was appointed as Officiating Superintendent, Pattambi.

The special post of an Assistant Director of Agriculture sanctioned on 27th March 1936, for work connected with Cauvery-Mettur Project area was filled by Mr. P. S. Manian, Assistant Director of Agriculture, Bellary, on 3rd September 1936, and his place at Bellary was taken up by Mr. A. Ramaswami Ayyar, Agricultural Demonstrator.

To assist in development work connected with marketing, a post of Assistant Marketing Officer was sanctioned for a period of one year which was filled by Mr. U. Vittal Rao, Officiating Assistant Director of Agriculture.

For research work on groundnut at the Agricultural Research Station, Tindivanam, financed by the Imperial Council of Agricultural Research, a post of superintendent in the Madras Agricultural Service was created for a period of five years and Mr. C. M. John, Senior Assistant in Oil Seeds, was appointed to it.

A gazetted post of Assistant Agricultural Chemist was sanctioned in December 1936, for carrying out a soil survey on an intensive scale in the Tungabhadra Project area. This post has not yet been filled pending the acquisition of lands required for starting an irrigation experiment station in the project area to study the various problems that are likely to arise from irrigating dry crops.

The continuance of the temporary post of Superintendent, Rice Research Station, Berhampur, and Superintendent, Dry Farming Station, Hagari, and the business manager in charge of the Co. 2 seed multiplication and extension scheme was sanctioned during the year.

Messrs. P. V. Ramiah, R. Swami Rao, C. V. Ramaswami Ayyar and G. Jogi Raju were confirmed in their appointments during the year.

(c) *Madras Agricultural Subordinate Service.*—The upper subordinate cadre was increased temporarily by 56 posts during the year as detailed below. Forty of these are intended for district work. With this addition it is possible to provide each taluk in the Presidency with *one demonstrator*. This has been for long the aim of the department and as soon as these men are trained they will be posted to their respective taluks.

	Posts.
Rice sub-stations at Nellore and Tinnevelly ..	2
Scheme for research on groundnut	2
Tungabhadra Soil Survey	5
Scheme for taxonomical research on fruits at the Fruit Research Station, Kodur	1
Scheme for Dry Farming Research in Anantapur district	1
Mahali disease control work	2
Agricultural demonstrators for district work ..	40
Gundlakamma Scheme	3
Total ..	56

II.—Agricultural Education.

5. *Agricultural College, Coimbatore.*—There was a decided increase in the number of applications to the college this year. One hundred and fifty-six applications were received as against 116 and 91 in the two previous years. Of this number, 117 candidates appeared for interview before the selection committee of whom 44 were selected and 17 were placed in the waiting list. Only 39 joined the college and three were admitted from the waiting list. Five failed students were re-admitted. The final strength of class I stood at 47.

Scholarships.—Of the five scholarships, two were given to Muhammadans and three to backward classes. The scholarship which was re-allotted to a student of the third-year class in G.O. No. 1320, Development, dated 24th September 1935, having fallen vacant, it was re-allotted for a year and given to a scheduled class student of class II.

Examinations.—The number of candidates that appeared for the B.Sc. (Ag.) examinations in 1936 and passed is as follows :—

	Number appeared.	Number passed.
First examination ..	44	37
Second examination ..	26	16 + 6 who failed in one subject only and are eligible for attending B.Sc. (Ag.) Class III.
Final examination ..	36	28

Fifteen candidates referred from the second examination in 1935, appeared this year of whom 13 passed and two were referred, and all the three candidates referred from the final examination in 1935 appeared for one subject and passed.

Lectures and tours.—Thirteen special lectures were given to students by various research officers during the year. The students of class III were taken on tour in October 1936 to Ongole, Narasaraopet, Nandyal, Bangalore and Hosur, and students of class II to Trichur, Pattambi, Kasargod, Mangalore, Udipi, Coorg, Mysore and Bangalore in January 1937.

6. *Agricultural Middle schools.*—The school at Usilampatti continued to be under the management of District Board, Madura. Twenty-six students underwent training during the year. The District Board is contemplating to amalgamate the middle school with the Board High School at Usilampatti and orders of Government on the proposal of the District Board are awaited. This is, however, being continued this year pending receipt of orders from Government.

7. *Farm Labourers' Schools.*—The three schools at Anakapalle, Palur and Coimbatore continued to function during the year with day and night classes at Anakapalle and with day classes alone at Palur and Coimbatore. At Anakapalle, there were 25 boys on the rolls during the year as against 24 of last year. There were 20 adults in the night school. At Palur, there were 31 on the rolls as against 28 of last year. The night school was closed under orders of Government. At Coimbatore, there were three boys in the school with wages and 24 boys without wages as against 5 and 14 respectively during last year.

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

	Course.	Number of students admitted.
1	Farm Management	12
2	Care of animals	13
3	Dairy training	14
4	Malt making	19
5	Insect pests and diseases	17
6	Jaggery making	21
7	Bee-keeping	22
8	Horticulture	16

Students attending "Farm management" course were permitted to attend other courses also.

With a view to make the short courses popular, it was thought desirable to confine them as far as possible to linguistic areas. Under orders of Government these were started at the agricultural stations, Nandyal and Taliparamba during 1936–37. The course lasted for ten months. At Nandyal, 20 students were selected but

only eight joined the course of whom one died, three left in the middle and the remaining four completed the course. At Taliparamba, 12 students were admitted, of whom nine left in the middle of the course and three completed. The course is being continued this year also in the above two stations.

In order to solve at least in part the unemployment problem among the educated young men belonging to the landowning agricultural families and thereby afford them an opportunity to take an interest in their own lands, Government sanctioned the institution of a course of practical training in agriculture for a period of four months to be given to 150 students at the several Agricultural Research Stations in the Presidency. During the period of training, the students were given a stipend of Rs. 15 a month. Selections were made by the Collectors of districts in consultation with Deputy Directors of Agriculture or Assistant Directors of Agriculture after interview, and the final selection was made by the Director of Agriculture. One hundred and twenty-eight students were admitted at several stations of whom only seventy-three completed the course. The remaining 55 did not join at all or left the course in the middle. The students who attended this course suffered from certain disabilities which were partly responsible for the unpopularity of the course. These defects have been brought to the notice of Government with a view to have them remedied as far as possible.

9. *Class on co-operation.*—As there was no sufficient response from the students of the Agricultural College, the course in co-operation was discontinued under orders of Government.

10. *Dairy.*—At the beginning of the year, there were on an average 28·8 cows in the herd of which 21·6 were in milk and 7·2 dry as against 29·2, 21·1 and 8·1, respectively in the previous year. The percentage of cows in milk to the total number in the herd was 75·0 as against 71·9 in the previous year.

The total quantity of the milk handled during the year (including 1,703 lb. of outside milk purchased to meet the requirements during severe outbreak of foot and mouth disease in the herd) was 115,061 lb. as against 119,245 lb. handled in the previous year. This quantity was disposed of as follows :—

	LB.
Sold	80,467
Fed to calves	10,237
Separated	22,909
Colostrum ; for exhibition, etc.	1,448
Total .	115,061

Out of 22,909 lb. of milk that were separated during the year as against 17,838 lb. in the previous year, 2,210 lb. of cream were obtained. The cream was converted into butter and the quantity

of butter obtained was 1,269 lb. out of which 829 lb. were sold and 381 lb. were converted into ghee. In the previous year, 1,776 lb. of cream were converted into 989 lb. of butter.

The receipts from the dairy during the year amounted to Rs. 11,081 and the expenditure to Rs. 10,889 as against Rs. 11,603 and Rs. 12,856, respectively in the previous year. The financial working of the dairy discloses a profit of Rs. 192 as against a loss of Rs. 1,253 in the previous year. The decrease in expenditure and the small profit this year are due to (i) reduction in the amount of depreciation charges in respect of sheds used for housing and milking cows, and (ii) to the inclusion in the accounts of only a proportionate share of items which do not vary in the production of butter as contemplated in G.O. No. 821, Development, dated 5th April 1937.

11. *College Day and Conference.*—The twenty-fifth College Day and Conference combined with the celebration by the Madras Agricultural Students' Union of the Diamond Jubilee of Agricultural Education in India was held on 29th, 30th and 31st July 1936. A departmental exhibition on a large scale was also got up for the occasion. His Excellency the Governor of Madras, Sir K. V. Reddi Nayudu Garu, presided over the conference and distributed the prizes to the students on the first day and also opened the exhibition. The Hon'ble Minister for Public Works, Mr. (now Sir) P. T. Rajan, presided over the conference. The papers that were read at the conference and the discussions that followed them were as usual of a high order.

III.—Season.

12. The south-west monsoon set in earlier this year than in the previous two years. It appeared simultaneously in the south Bay of Bengal and in the south-east Arabian sea on the 19th/20th May and caused heavy rains in Malabar and South Kanara and fairly widespread thunderstorms in the North Madras coast during the latter half of the month. Despite short spells of activity, the monsoon was generally weak in the first half of June. The rainfall during this month was normal or above normal in the Circars (Kistna and Guntur excepted), the Deccan, the Carnatic, Chittoor, Tinnevelly, South Kanara and the Nilgiris. The monsoon was fairly active in Malabar in July and the rainfall in the month was bordering on or above normal in the Presidency except in the Deccan and the Nilgiris. A weakening of the monsoon was noticed in August when the rainfall was below normal except in Vizagapatam, East and West Godavari and the West Coast. There were good rains towards the end of September in Bellary, Anantapur, Chittoor, Salem, Coimbatore, Madura, Ramnad, Tinnevelly, Malabar and the Nilgiris. The south-west monsoon was on the whole defective except in Vizagapatam, East and West Godavari, Chingleput, Chittoor, Coimbatore, Ramnad, Tinnevelly, the West Coast

and the Nilgiris. The sowings of crops was generally satisfactory except in the Deccan where it was restricted in the case of both wet and dry crops; wet crops were restricted in the Carnatic and central districts and dry crops in the south.

The north-east monsoon which set in over the Bay of Bengal early in the third week of October became established towards the middle of that week. The depression formed in the south of the Bay on the 25th October developed into a cyclonic storm during the course of the day which took a northerly course on the 27th. It developed further into a storm of severe intensity and crossed the Circars near Masulipatam on the 28th. The storm caused widespread and heavy rain along the East Madras and Orissa coasts between the 26th and 28th. A heavy fall of 11 inches of rain was recorded at Cocanada on the 28th. The storm was responsible for a severe damage in the east coast districts which lay along and near its track. The damage extended from the north of the Nellore district to the East Godavari district. It was very severe in the Bapatla taluk of the Guntur district. Many thatched-sheds collapsed, roofs of well-built structures were blown away in many cases, crops and livestock were lost, trees, telegraph and telephone lines were uprooted in the storm affected regions. Except in the Circars, the rainfall in October 1936 was below normal. The monsoon was again active in November. A disturbance in the Bay from the 4th to 7th caused widespread and locally heavy rain in south-east Madras and the north Madras coast, Nellore reporting 14" on the 7th. The monsoon weakened in December and the rainfall during the month was below normal except in Coimbatore, Madura and Ramnad. Except for a few falls of rain in January in the south-east Madras, there was practically no rain in January to March 1937. The north-east monsoon was on the whole above normal only in the Circars, Bellary, Anantapur, Nellore, Madura, Ramnad, Tinnevelly and South Kanara.

The effect of the season on the crops at the various agricultural research stations.—The season was favourable for all crops generally at Berhampur, Anakapalle, Nandyal, Palur, Aduturai and Pattambi. The early break of the south-west monsoon combined with the hot weather rains depressed paddy yields considerably at Samalkota; and the heavy rains in October along with the storm resulted in lodging sugarcane on this station and caused damage to plantain and sugarcane at Maruteru. At Guntur, all the early crops, especially groundnut, came up well but the storm and heavy rains in October spoiled the tobacco and chillie nurseries and affected the yields of early crops. The late rains in January and February were detrimental to cotton and *pyru jonna*—flower buds were badly shed in the former and in the latter the grain did not set well. The south-west monsoon was a failure at Hagari and the bad distribution of the rains during the north-east monsoon affected the yields of the late-sown crops. The season was quite favourable to fruit at Kodur and sugarcane at Gudiyattam while the rainfall at Tindivanam was deficient and almost all the crops were

ffected there. Owing to the uneven distribution or rains at Pattukottai, dry and garden crops were affected. The groundnut crop vas affected by *surul puchi* and paddy seedlings were damaged by hrips owing to drought. At Koilpatti, cereals came up well but he inadequacy of rains resulted in the production of a poor cotton rop which suffered in the later stages. The season was favourble to most of the crops except pepper at Taliparamba. At Nanjad while the season favoured potatoes it was bad for *samai*. The eosan was anything but satisfactory at the Cenfral Farm, Coimbaore. Heavy showers followed by long breaks affected the rainfed crops which have given almost the lowest yields on record. For the same reason the yields of crops on the Cotton Breeding Station were affected. Paddy on the Central farm as well as on the Paddy Breeding station was not affected as there was a regular and continuous supply of water in the channels.

IV.—Research.

A.—Botany.

13. The systematic side of the activities of the section consisted in the identification of 545 botanical specimens and incorporation into the Herbarium of 778 specimens of Ganjam collection. Under economic botany, the plantain survey was continued in the districts of Cuddapah, Kurnool and Anantapur. A new variety collected at Kalava in Kurnool district is under trial at Coimbatore. Twenty-two local varieties were studied in detail. Banana products like figs, crisps, nut and flour were made for purposes of exhibition. Fodder grasses were continued to be grown under irrigation on a small scale. *Panicum maximum* again gave the highest yield. But these trials are not comparable with those grown under rainfed conditions in grazing areas.

B.—Chemistry.

14. This section which is the largest at the Research Institute, covers a wide ground. Samples of human foods from jails and hospitals, animal feeding-stuffs and fodders, waters for irrigation purposes, manures and soils were analysed and advice given to the public and departments of Government. Analytical work consisted of the analysis of 2,155 samples as against 1,475 in the previous year.

Of recent date, special soil surveys have come into prominence. While formerly systematic soil surveys were made of a number of districts, the present idea is to tackle particular problems that would arise in different districts, and with irrigation schemes coming into importance during recent years soils traversed by such schemes are surveyed. In the wake of the Tungabhadra soil survey made last year, surveys of the Cauvery-Mettur project area, Kulitalai high level channel area and Gundlakamma project area were undertaken. The last is in progress. The broad facts brought to light by the survey of the Cauvery-Mettur project area

are that in 95 per cent of the area, the soils are red and light loams, black soils occupying the remainder, and that soils are poor requiring judicious manuring and improvement in drainage.

Arising out of the survey of the soils of the Tungabhadra project, was the investigation of the origin of the black and red soils of that area. The work was of a preliminary nature but threw light on the problem which seems to be connected with the minerological composition of the parent rock rather than with environmental influences during soil formation.

The effect of sullage water on paddy was again tested during the year and it was found that by its use yields of grain and straw were increased by 35 per cent and 24 per cent respectively as compared with the use of channel water alone. The three years' experience indicated that undiluted effluent has a deleterious effect on the growth of seedlings in their early stages but later on it helped to improve the tillering capacity of the plants thereby increasing the yield.

In regard to work on animal nutrition the investigation was to see if any correlation exists between work turned out and protein consumed by working bullocks. To this end, two sets of animals were employed at work for 8 hours and 6 hours a day when it was found that while the quantity of protein required by the animals working for 8 hours was 500 grams, the animals working for 6 hours required only 400 grams. This finding seems to lead one to suppose that the protein is a linear function of the quantum of work and that the tissue breakdown is proportional to the strain imposed.

In regard to mineral metabolism of dairy cows and young stock, experiments on mineral balance as regards lime and phosphate showed that while the young stock required a ratio of 1 : 1 for their growth, the ratio for cows was 2 : 1 for milk production.

A number of grasses was analysed for mineral content. Those from the hill grazings near Coimbatore showed serious deficiencies in minerals, while pastures in Ongole taluk of Guntur district showed that they had a good mineral content. This finding emphasises the need for systematic research in pastures in different cattle breeding districts.

In regard to the use of molasses as cattle food, a cake was prepared from it by mixing it with certain oil-cakes and mineral mixture with a view to give it a hard brick consistency and of a definite composition. Further work is necessary to ascertain its food value.

Work on sulphur metabolism of sheep and poultry nutrition was continued.

On the micro-biological side, an organism was isolated and studied for its nitrogen fixing power. A method was developed to inoculate cereal seeds like sorghum and wheat with a culture of the organism. This method has given promise of good results.

Studies on the keeping quality of milk after boiling indicated that bacterial infection was greatest in unfavourable storage conditions.

Further work on active carbon was continued with a view to cheapening the product and increasing the efficiency of the furnace. The cost of carbon per pound is in the neighbourhood of Re. 0-1-3 as compared to Re. 0-1-9 last year. By re-activating the carbon it is found that it had the same effect as the original carbon. The cost in producing it was about 4 pies per lb.

Causes for the development of a red colour on boiling cane juice and for the production of a brown colour in cream jaggery on keeping were under investigation, while tests for increasing the yield of sugar from rab as well as obtaining jaggery and sugar from palm juice free from toddy flavour were carried out.

Work on sorghum malt was continued under the auspices of the Imperial Council of Agricultural Research. Eight new varieties of sorghum were analysed in regard to their suitability for malting. Bulk malting of large quantities of sorghum, ragi and wheat were carried out under different conditions of couching and losses on malting were compared. Malt bread and biscuits, grape nuts, etc., were prepared.

C.—Crops.

(1) Cereals.

15. (*a*) *Millets*—(i) *Sorghum.*—Under irrigated sorghums there are two principal varieties, *chittirai vellai* and *chittirai manjal.* A.S. 732, a strain of the former, was found superior to M.S. 3155, the farm bulk, for the second time. In the main season crop comparative trials were made with *Periamanjal*, *Talaivirichan* and *Tenkasi white cholam.* In the Periamanjal series, A.S. 29 and A.S. 1098 continued to be the best. In *Talaivirichan*, 4 strains were under comparative trial while A.S. 550 in the *Tenkasi* variety was found to be the best. This last was a little too early for the main season having been caught in the monsoon and spoiled.

Importance of fodder cannot be exaggerated. The improvement of straw along with the improvement of grain is therefore essential. Fourteen varieties of sorghum were selected for this purpose and their degree of sweetness was tested. Sucrose content in them ranged from 2 to 13 per cent. In a country where fodder is scarce, the question of increasing bulk is of greater importance than of evolving juicy and sweet varieties.

Striga is a parasite, on the roots of sorghum. With a view to obtain varieties resistant to this parasite, single plant selections were made. All local varieties were found to be highly susceptible and even a particular variety famous for its resistance in Kurnool and Guntur districts also proved to be susceptible in Coimbatore.

Studies on the waxy bloom on different portions of the plant, size and shape of anthers, pollen germination, the linkage

between the blackish purple colour of sheath and glume and the brown colour of the nucellar layer of the grain were in progress. About 9,400 lb. of seed of strains of sorghum were distributed in the districts.

At Guntur 312 units were under preliminary study and 41 under comparative trials.

Investigations at Hagari showed that twelve strains among a large number have given higher yields than the control but none has shown its outstanding superiority to the old selections.

At Nandyal strain No. 224 gave consistently good yields during the last three years and this year its superiority over the local seed was as much as 35 per cent.

(ii) *Ragi* (*Eleusine coracana*).—Among the summer season varieties there are strains which are both short and long in duration. Of the former, E.C. 3517 and E.C. 3030 with durations of 112 and 117 days respectively were the best. In the latter, E.C. 593 still held its own, although E.C. 2985 was found to be as good as the former. In the main season, E.C. 2985 gave a 10 per cent increase over E.C. 593. In the short duration series, E.C. 3517 yielded well and it is intended to test it further in the districts. The relative nutritive value of brown and white ragi was tested by the Government Agricultural Chemist and it was found that while white ragi had a higher nutritive value, the brown ragi protein had a higher biological value. About 4,500 lb. of seed of ragi were distributed by the section.

At Anakapalle where ragi was grown in both the seasons Bobbili No. 5 gave an yield of 2,280 lb. per acre in the early season, and strain No. 274 yielded in the late season 2,596 lb. per acre.

(iii) *Cumbu* (*Pennisetum typhoideum.*)—P.T. 2125 and P.T. 2548 were good in comparative trials as irrigated crops giving 19 per cent and 41 per cent increases respectively over their controls. Among the rainfed varieties P.T. 248 and P.T. 504 were found superior to others.

A study on the bristliness of *cumbu* indicated that the longer the bristle the greater the shedding and the lesser the density in the packing of the grain.

(iv) *Korra* (*Setaria Italica*).—S.I. 523 gave a 25 per cent increase over the standard in the comparative trials.

(*b*) *Paddy*.—The season for paddy throughout the Presidency except in one or two instances was favourable for the conduct of research which followed the usual lines.

(i) *Pure line selection*.—Work in varieties from Tinnevelly, Madura, Chingleput and Chittoor districts was done at Coimbatore. One of the three strains of *sendinayagam* of Tinnevelly referred to in last year's report gave an increase of 17 per cent over the standard and awaits being released for distribution under the name of Co. 12.

At Maruteru, strains Mtu. 9, Mtu. 10 and Mtu. 11 which are selections from *garikasannavari*, *sannakrishnakatukalu* and *konamani* respectively and whose superiority over the standards varied from 18 to 30 per cent were released for distribution in the district.

Six hundred selections and 189 cultures were under trial at Pattambi.

At Berhampur, 10 strains from 5 of the chief varieties of Ganjam yielded from 15 to 20 per cent over their respective standards based on trials extending over four years. Seeds of these strains have been handed over to the Deputy Director concerned for multiplication and trial in the district.

At Anakapalle, strains 355, 13 and 263 which yielded similarly were better than Mypali bulk.

Of the 133 single plant selections done at Samalkot, 38 are promising.

At Aduturai, Vellaikar strain No. 798 gave an increased yield of 14 per cent over the standard and will be released under the name of Adt. 14. A mutant from, Adt. 4 (6119), tested for three years gave an average increase of 23·7 per cent over the standard. Reports on this strain from Trichinopoly and Tanjore districts are favourable. It is proposed to send it out into the district as Adt. 15 next season.

(ii) *Hybridisation*.—This is an important method adopted in the improvement of crops by which it is possible not only to increase the yield but also introduce vigour and other good qualities present in the parents. Three hybrid strains resistant to paddy blast and two non-lodging high yielding strains all of which were isolated at Coimbatore, continued to do well in the districts. Besides, there were 323 strains from a number of crosses under various stages of trial. Similar work is being done at Maruteru and Pattambi.

(iii) The important role X-ray plays in crop improvement is well known. Very interesting types of mutants for dwarfness, habit, sterility, etc., have been isolated from X-rayed seed material, besides adding an interesting ageotropic mutant to the list. There are certain X-rayed mutant cultures from G.E.B. 24 which promise to yield better than it.

Studies on the inheritance of characters, hybrid vigour in rice, root studies, and alkaline resistance were under way at Coimbatore.

Experiments on the storage of paddy grain indicated that ventilation at the bottom of the bins gave to the grain better cooking qualities than if the ventilation was given from the side.

In the study of the quality in rice it was observed that most of the market samples of raw polished white rice showed the absence of the aleurone layers which meant the absence of

tryptophane, an important principle in rice necessary for animal diet.

Histological study of seed coat during the developmental stages of different coloured rices was also undertaken. There is an indication that cultivated coloured rices, those grown under swamp and well manured conditions and glutinous rices develop a thicker aleurone layer than the wild white starchy rices grown under rainfed or unmanured conditions.

Agronomy—(a) Cultural trials.—In the dibbling ***versus*** transplanting experiment, the latter was found preferable as the former caused plants to lodge prematurely in view of the shallow root system developed in this method.

At Pattambi, in double crop wet lands broadcasting early in the first-crop season was found to give significantly higher yields than either transplanting or broadcasting at a later date.

At Berhampur, while no difference could be noticed between broadcasting and transplanting, it has been established that in a transplant crop 6″ is the optimum spacing for paddy.

At Pattambi in the age of seedlings experiment, seedlings upto 60 days had no bad effect on the yield so long as the time of planting for the second crop was normal, but at Berhampur and Maruteru to obtain high yields it was found desirable that the seedlings should be 40 days old. At Aduturai, it was found that the age at which ryots plant their seedlings was the most suitable. At Samalkot, comparative trials of seedlings raised under wet, semi-wet and dry conditions showed that seedlings planted under wet and dry methods gave higher yields than those planted under semi-wet conditions. The semi-wet seedlings, however, were earlier in maturity by 5 to 10 days.

(*b*) *Manurial trials.*—At Coimbatore and Berhampur, manuring the seed-bed heavily instead of the transplanted field had no effect on yield. At Berhampur, it was shown that the addition of 100 lb. of Ammophos to 4,000 lb. of a basal dressing of green leaf was uneconomical and that the application of green leaf from 2,000 to 10,000 lb. per acre gave progressively significant increases in yield.

At Pattambi, in the case of both first and second crops groundnut cake was found superior to green leaf when similar doses of nitrogen were supplied. Sulphate of Ammonia applied a month after planting yielded better than green leaf or Niciphos, all supplying 30 lb. nitrogen per acre.

At Samalkot, manurial experiments on the second crop indicated that organic manures alone or in combination with phosphatic manures are better than inorganic manures alone or in combination with phosphatic manures but the differences are not significant in some cases.

(*c*) *Irrigation experiments.*—At Coimbatore irrigation applied at intervals of 5 and 10 days showed that copious irrigation at wide intervals gave better yield than smaller quantities at shorter intervals.

At Maruteru where an irrigation experiment has been in progress for some years it was found that the duty for the first crop during the year worked out to 81.

Economics of rice-growing.—This experiment has been going on for some years at Coimbatore, Maruteru and Pattambi. When several departmental improvements were adopted the net profits this year as compared with last year are as follows:—

	1936-37.	1935-36.
	RS.	RS.
Coimbatore (single crop)	90	77
Maruteru (double crop)	67	77
Pattambi (double crop)	62	88

Better prices for paddy and straw prevailing this year in Coimbatore were responsible for greater profit when compared with the other two stations.

(2) Fibres (cotton).

16. (*a*) *Breeding.*—At Coimbatore for the third time the rainfall was deficient and the season was not particularly propitious for research work on cotton. In order to hasten breeding work in Cambodia cotton, it was found desirable to produce two generations of cultures in a single year instead of one. To this end, a small area was leased at Srivilliputtur in Ramnad district where Cambodia strains were grown from March to September. The best among these were brought back again to Coimbatore for the September sowings.

(i) *Pure line selection.*—Co. 2, the most popular strain in Cambodia, and which occupies more than 2 lakhs of acres in this Presidency has the disadvantage of being late in maturing and is therefore not quite suitable for rainfed areas. With a view to evolve earlier types a number of varieties were imported from other countries to isolate suitable types either by selection, hybridisation or acclimatisation.

At Koilpatti, Kpt. 1 led the other strains yielding 366 lb. per acre as compared with A. 10 and C. 7 which respectively gave 324 lb. and 320 lb. per acre.

At Hagari, it has been observed that H. 1 deteriorates when grown under ryots' conditions for 4 or 5 years. It was also noticed that the yield and quality of lint obtained from non-fuzzy H. 1 seed is inferior to the fuzzy. Therefore even a small mixture of the non-fuzzy type is bound to cause deterioration.

At Nandyal, cotton strain No. 1346 from Indicum gave consistently higher yields than N. 11 during the last three years. The difference this year in favour of the strain was as much as 41 per cent.

At Guntur, 41 fresh selections were made during the year and six of the previous year were put down to comparative trials.

(ii) *Hybridisation.*—Out of 892 cultures, 28 excelled the standard in yield and indicated to be early up to one month. Co. 2 was hybridised with a drought resistant wild cotton of Hawaii. Steps were also taken to evolve cottons of finer and longer fibres by crossing Co. 2 with the famous Egyptian and Sea Island cotton varieties.

(iii) *Other studies.*—The study of floral anatomy of the Asiatic and American groups of cotton showed that by the observation of the distribution of vascular bundles in the floral receptacle it has been possible to distinguish the wild from the cultivated species and to divide the latter into five different species.

The mode of inheritance of plant height, lintlessness and colour of lint were under further study. The study of the distribution of the jassid, an important insect pest on the American cotton, was pursued to a greater degree this year. It was observed that the relationship between leaf hairiness and intensity of jassid incidence was not as close as is generally supposed to be.

(iv) A number of Mungari strains in the Bellary district was compared in five centres. The Indian Central Cotton Committee recently sanctioned a scheme for improvement of Mungari cotton in that area.

(*b*) *Agronomy.*—Reference has been made in the previous report to the growing of pulses in association with sorghum. It has once again been observed that it neither benefited the sorghum nor corrected its harmful after-effects. At Coimbatore pure crops of cowpea and soya beans tended to depress the yield of Cambodia succeeding them.

Observations on the water requirements of Cambodia cotton pointed out that the crop required copious irrigation till about three weeks after the onset of flowering after which the irrigations should be sparing.

(*c*) *Schemes financed by the Indian Central Cotton Committee*—(1) *Madras Herbaceum Scheme.*—As a result of crossing with different varieties a large amount of material, good in lint length, ginning percentage and yield, was obtained. Strain 4714 evolved as a result of research work on this scheme was put under field trials in the districts. It is observed that this strain is suited to seasonal conditions prevailing in tracts up to Virudunagar. Reference was made last year to the disadvantage of its having a narrow leaf which might be mistaken for short stapled Roseum cotton. This has since been obviated by the isolation of a broad leaf mutant which gave as much yield as the strain itself.

(2) *Madras Pempheres and Physiological Scheme.*—Last year an interesting connection between the extent of water soluble polysaccharides in the stem and the readiness of the plant to produce gum to arrest the development of the insect was noticed. Further observations and analysis, however, during the year indicated that the amount of polysaccharides formed depended on the seasonal conditions. It has also been found that the composition of the polysaccharides of the leaves differed from that found in the wood, and therefore attempts at selection of resistant types cannot be made only from analysing easily removable parts like the leaf and petiole.

It was also observed that *pempheres* had at least ten other hosts, mostly weeds which indicated that it might be an indigenous insect which developed into a pest on the introduction of Cambodia which seems to be such a suitable host.

The introduction of parasites on the *pempheres* has met with a limited success. Two more parasites were collected from weevil grubs developing in alternative food plants. Though sixteen different species of the borer parasite were imported from northern India, only two were able to parasitise on the pempheres and that inefficiently. Spathius, the local parasite, continued to give encouraging results.

The isolation of strains in Karunganni resistant to shedding was continued at Koilpatti with promising results.

(3) *Madras Nadam Breeding Scheme.*—Work was done at Perundurai in Coimbatore district on leased land. Rainfall was deficient by ten inches which made the crop stunted and poor. Even the local Nadam variety which ordinarily yields 60 lb. in the first year and 200 lb. in the second, produced this year hardly any crop in the first year and about 100 lb. in the second year. Four of the exotic types were tried on the cultivators' field, two of which yielded more than 100 lb. per acre. *Nadam* cotton remains in the field for a number of years, while the new types have to be sown afresh every year. In spite of this disadvantage it is found that the cultivation of these types still leaves a margin of profit. It is also observed that the time of sowing is more important than even manuring or ridging.

(4) *Madras Fodder Cholam Scheme.*—This scheme ran through its full period of six years and was actually closed in June 1937. All agronomic experiments were carried out at Koilpatti and bio-chemical work at Coimbatore. It was definitely established that the deleterious effect of sorghum was due to the rise of sodium salts from the lower layers. Growing of sorghum along with pulses did not improve the soil condition. Cotton sown thick was able to induce normal yields. Correctives like gypsum, sulphur and magnesium sulphate had no appreciable effect on sorghum. Application of molasses as a corrective to alkalinity showed better growth in the treated plot.

(3) Fodders.

17. At Coimbatore, in a comparative test made between fodder sorghum and fodder maize, it was found that the tonnage of *sorghum* sown between August and January was poor when compared with that sown during the remaining months of the year, whereas maize behaved fairly uniformly all through the year. A very rough test made of the two crops in regard to monthly plantings indicated that it is more advantageous to grow maize between September and January and to confine the growing of sorghum to the remaining seven months in the year. Sweet potato vine when given as green fodder to milch cattle resulted in a marked increase in the yield of milk.

At Guntur, besides maize, teosinte and fodder sorghum, *kollaganjeru* (*Ipomea hispada*), another well-known local fodder, was grown over $2\frac{1}{2}$ acres during the cold season. *Pillipesara* (*Phaseolus trilobus*), another fodder legume, was grown mixed with fodder sorghum.

At Nandyal, ten fodder sorghum strains were under trial for the third time. Strain No. 29/82 gave a good yield of over 20,000 lb. for the second time.

At Hagari, besides the usual fodder crops, two species of salt bush were under trial. One of them (*Atriplex nummularium*) grew well but cattle did not relish it.

At Koilpatti, maize, teosinte and fodder sorghum yielded respectively 30,700, 19,000 and 30,200 lb. per acre of green fodder. With the applications of night soil compost and copious irrigation, guinea grass gave a heavy yield of 67,000 lb. per acre.

(4) Fruit.

18. The Fruit Research Station at Kodur which is financed by the Imperial Council of Agricultural Research continued to function during the year. The season was reported to have been fairly favourable for the propagation of fruit. Research work in regard to propagation of citrus by budding was done and technique suited to local conditions was worked out. Investigation made on one variety of citrus indicated that the best results could be achieved if the wood attached to the bud shield was retained before the insertion of the bud and that July and August are the best months for budding. Among root stocks, *gajanimma* has given the most vigorous growth. A large collection of material in citrus was made for the study of nomenclature and classification as a preliminary step to the improvement of fruit and its marketing.

Steps were taken to propagate types of mangoes and citrus of good quality and of commercial importance. In regard to mango, preliminary work showed that July to September are the best months for inarching. Whether this fruit tree can be propagated vegetatively, whether it could be successfully top worked was also investigated. A very simple dehydrater was designed for the preparation of banana "fig" and a small hand canning machine was also obtained; preliminary experiments on it were fairly successful.

At Coonoor, 145 grafts of various kinds of fruit trees were planted during the year. Nearly 300 plants of apples, pears, oranges and grape fruit were successfully grafted. A total yield of 7,964 lb. of fruit was obtained as against 10,000 lb. last year.

At Burliar and Kallar, the usual operations were gone through at both the stations and about 13,700 lb. of fruit were harvested.

At Samalkot, forty varieties of plantain were under study. Attempts at hybridization were fairly successful and a few crosses obtained. A few wilt resistant varieties from Trinidad were imported for a comparative trial. Several plantain varieties were under study at Tindivanam and Adudurai.

At Coimbatore, a few orange and lime plants were added. The irrigational difficulties existing in the orchard did not give much scope for further expansion.

At Taliparamba, manurial trials and a systematic study of pine apple were under way.

(5) Oil seeds.

19. Research work consisted in the investigation of groundnut, castor, coconut and gingelly, with the triple object of obtaining increased yield, improved quality and reduced cost of production.

(*i*) *Groundnut.*—An intensive scheme of research on groundnut sanctioned by the Imperial Council of Agricultural Research was started in January 1937. The results achieved here will be of importance to the whole of India. The season, in view of the severe drought during September and October was not favourable for research work.

(*a*) *Pure line selection.*—A.H. 218, a selection from Gudiyattam bunch, a local short duration variety, gave a significant increase of 14 per cent over the control. There were 65 selections in the spreading variety in the final comparative trial, six of which have yielded more than the control. Besides these, about 60 selections were under preliminary yield trials.

A.H. 25 which is the most promising improved variety we have at present was tried in 52 centres comprising eight districts in the Presidency in all of which with the exception of two, it showed its superiority.

(*b*) *Hybridization.*—Thirty F_1 crosses and 303 selections from F_3 and F_4 progenies of crosses were made. Some promising erect and fodder types have been isolated.

(c) *Other studies.*—A large number of samples of varieties in selections were analysed for the oil and free fatty acid content. The shelling percentage, the numbers of kernels found in each, natural test weights and other qualitative trials were undertaken. In a test for wilt resistance, it was found that bunch varieties were more susceptible than the spreading varieties and local Mauritius was found to suffer least from it.

Bunch varieties have the habit of germinating even while the crop is standing. When a test was made for the periods of dormancy, it was observed that only those bunch varieties which had some blood of the spreading varieties remained dormant like the spreading varieties.

(d) *Grade standards.*—At the request of the Imperial Council of Agricultural Research, a comprehensive work of analysis of samples of the groundnuts collected from all over India was undertaken. Three hundred and eighty-five samples were analysed for refraction, and 101 for oil and free fatty acid content. In Madras samples, the oil content varied from 49 to 53 per cent but the majority of them contained 50 per cent.

(ii) *Castor.*—Eight economic types isolated from the Presidency varieties were under trial. Twenty-seven selections isolated from a cross were under trial. These matured in five months as against 8½ months required by the control. The shelling percentages, natural test weights, numbers of beans per pound were determined for all the selections. A large number of analyses for oil and free fatty acid content was made. The range of variation in the percentage of oil was from 35 to 61.

(iii) *Gingelly.*—Mass selected seed of old varieties was grown, those from Anakapalle and Giddalore giving significant increase over the local. With a view to maintain purity, all the types were selfed. Fifteen samples were analysed for oil and free fatty acid content: the highest which was obtained from Nayudupet in Nellore district gave 52 per cent of oil.

(iv) *Coconut.*—Work on this important crop is confined to the four stations on the West Coast. The season while satisfactory during the hot weather period was poor during the north-east monsoon. Four hundred and forty seedlings raised from nuts obtained by hybridization, selfing and natural pollination, were planted out at Nileshwar II. Among crosses between dwarf and tall types, the progenies of dwarf male and tall female are more vigorous and are promising. Observations of two years on the rate of germination of seednuts and the rate of growth of seedlings showed that seednuts obtained from Kasaragod were superior to others. The best posture of planting nuts in the nursery seems to be the vertical and horizontal positions. It is usual to select seednuts from the middle-aged trees. An experiment designed to test the soundness of this practice indicated that there was no difference in the germination of seednuts

harvested in young, middle-aged and old palms but the germination of seed from the young palms was earlier which resulted in the production of more leaves. With a view to find out the characters of heavy yielders, the rate of production of leaves and the age of leaf were studied. Observations for five years on 100 trees indicated that the rate of production of leaves for good and poor yielders is about the same, but heavy bearers retain the leaf for a longer period. While there is a correlation between the number of leaves produced and the yield obtained, there is no such relation between the rate of production of leaves and yield.

An experiment was laid down to determine whether the application of manure in trenches is better than broadcasting it and how the most common manure on the West Coast compares with the practices recommended by the department. It showed that broadcasting of ammonium sulphate and ash gives the maximum increase in yield. The advantage of intercultivating coconut gardens was obvious. If a garden is left uncultivated even for a short period of two years, production of female flowers is reduced.

(6) Root crops.

20. *Potato.*—(i) This crop is confined to Nanjanad Agricultural Station on the Nilgiris. The season was favourable to potatoes. The area under the crop was about 21½ acres and as usual, three crops were raised. The irrigated, main and the second crops respectively yielded 600, 575 and 500 maunds per acre. The average acre yield during the last 15 years of the last two crops was 277 and 234 maunds respectively.

Breeding.—Work on artificial pollination was continued during the year in all the three crops. Six hundred and twenty-seven seedlings were obtained. Out of the two Russian types mentioned in the previous year's report, only one, namely, No. 8178 produced one tuber. Four exotic species were obtained from Dr. Hudson of Cambridge. Two hundred and seventy-seven hybrid varieties obtained were grown under irrigated conditions. Some of them indicate that they are both better yielders and earlier maturers than the control. Fourteen varieties were under row yield trials and eleven under comparative trials.

(ii) *Agronomy—Manurial trials.*—In the permanent manurial plots it was shown that the phosphatic series gave good results and that the beneficial effects of lime were noticeable. The earliest potatoes to mature were from the phosphatic series but the addition of nitrogen to phosphatic manures tended to slightly delay maturity. There are in the market several potato mixtures supplied by manure firms. With a view to find out their relative merits they were compared with the farm mixture which contains 85 lb. of nitrogen, 215 lb. of phospharic acid and 108 lb. of potash. The results this year indicate that the farm mixture in the "no cattle manure" series was as good

as Shaw Wallace's mixture but better than Parry's and Shaw Wallace's in the "cattle manure" series. In the second crop, the farm mixture with no cattle manure was better than all the other series. The Nanjanad mixture contains a large proportion of phosphoric acid. With a view to correct the acidity in the soil in recent years lime at the rate of 1½ tons per acre has been applied. In view of this it was thought that the dose of phosphatic manure could be reduced. An experiment to test this indicated that the full dose of phosphoric acid is necessary even if lime was added. Nitrogenous manurial experiments, compost experiments, inorganic manure *versus* Nanjanad mixture with different doses were other experiments done during the year. Irrigating potatoes once in alternate days, twice or once a week produced no differences in yield. A similar result was obtained in regard to irrigation before and after planting which confirm the results of the previous two years. In the size and spacing experiments, 2 oz. seed with 6 inches and 9 inches spacing gave the most economic returns. In the age and size of seed experiments, new seed was found superior to old seed and that whether 2 oz., 3 oz., or 4 oz., the yield was about the same but 1 oz. seed yielded poorest.

(7) Spices, condiments and narcotics.

21. (i) *Ginger.*—Comparative trials were under way in regard to Bengal, Trinidad, Canton and Yernad (local) varieties. The results indicate that the Trinidad, Canton and Bengal ginger are better than Yernad variety. Small quantities of Jamaica ginger (yellow and blue) were grown for purposes of seed multiplication.

(ii) *Pepper.*—The season was unfavourable for pepper. *Pollu* made its appearance which reduced the yield to about 50 per cent of the normal. The manurial experiments were continued on the same lines as before.

(iii) *Chillies.*—Two West Coast varieties (South Malabar and South Kanara) were compared with Pusa strains, T. 34, T. 41 and T. 51. In the experimental area, South Kanara variety gave the best yield.

In Guntur, 50 fresh selections were made during the year. Eight selections of last year were tried again compared with the local, six of which have given better yields than the local. In the comparative trials, strains 428 and 455 were added to the existing six selections. Strain 390 was the best followed by Nos. 398 and 363.

(iv) *Tobacco.*—Selections 16 and 19 yielded better than the local by 41 and 26 per cent respectively. Comparative trials on cigarette and cigar types of tobacco indicated that the cigarette type Adcock No. 13 yielded the best this year but in the cigar types the results are not significant. The crosses between local and exotic types have reached the fourth generation. A test to know whether green manure is desirable for tobacco or not showed that green manure prolonged the maturity and delayed curing.

(8) Sugarcane.

22. At Gudiyattam where work on sugarcane was started the previous year under the auspices of the Imperial Council of Agricultural Research, experiments on varietal trials were continued. Among those which are grown under restricted conditions with J. 247 as the standard, Co. 281 gave 20½ tons per acre as against nearly 7 tons of the former. Other varieties under test were Co. 313, Co. 243 and Co. 213. These also yielded better than J. 247. Grown under normal conditions, Co. 419 yielded best at 69 tons per acre as compared with 25 tons of J. 247. P.O.J. 2878 and Co. 408 yielded similarly whereas Red Mauritius gave only 15 tons per acre. Experiments on a comparison between intensively and poorly fertilized seed material and on ratooning gave inconclusive data.

At Anakapalle in the comparative study of yield of different varieties, it was found that Co. 419 yielded best at 55 tons per acre, other varieties being Co. 313, Co. 407 and P.O.J. 2878 with Co. 213 as control. In the manurial experiments, poorly fertilised seed material planted in a field receiving two-thirds of the normal manure gave the maximum yield, while richly fertilized seed material planted in a normally manured field gave the lowest yield. To see whether molasses has any manurial value, an experiment was laid down in comparison with ammonium sulphate, groundnut cake and green leaf, the doses of nitrogen in all cases being 26, 52 and 78 lb. Molasses containing 26 lb. of nitrogen yielded similar to other manures supplying the same amount of nitrogen. In the ratooning experiment Co. 243 and Co. 281 yielded at 38 tons per acre whereas M.A. 21 and J. 247 failed completely. An experiment was laid down to see if there was any relation between different spacings and number of irrigations. It was found that while 4 link spacing between lines gave the best yield, there was no difference in yield between different amounts of irrigation. In the single irrigation experiment, whether early or late planted, Co. 419 was the best yielder and Co. 373 the poorest. In an attempt to find if cane could be raised under rainfed conditions, it was found that the quality of jaggery was not satisfactory and that the cane matured after a year and a half when planted in October. A study on deterioration of cane was also conducted.

At Samalkot, 52 varieties were under study. In the single irrigation experiment, Co. 421 gave the highest yield of 55 tons of cane as against 40 tons of Co. 213. Under swamp conditions Co. 213, Co. 285 and Co. 281 were tried. Co. 213 gave the highest yield closely followed by Co. 285. Nine varieties were under detailed study. It was observed that P.O.J. 2878 is the

richest cane and the earliest to mature with a high purity. For earliness this variety is followed by Co. 422, Co. 419 and Co. 425. To see whether planting cane in trenches withstands lodging better than the local method of bed planting, an experiment was laid down last year and the experience gained was that trench planted plots did not lodge and withstood drought conditions better than plots planted in beds but this year's result was vitiated by poor germination owing to heavy hot weather rains which necessitated late planting. No conclusions could therefore be drawn. Other experiments in progress related to planting of setts *versus* seedlings, monthwar planting, manurial trials and cane nutrition.

At Palur, nine varieties were compared with one another in garden lands where Co. 419 topped the list for the second time at 60 tons per acre. P.O.J. 2878 yielded only 68 tons of cane per acre but in regard to yield jaggery it stood second. In wet lands where these varieties are under trial, Co. 419 again topped the list. Manurial trials started in 1932 were concluded during this year. It was found that 200 lb. of nitrogen as cake and ammonium sulphate together with 100 lb. of Phosphoric acid and 50 lb. of potash gave the best yield. By themsleves, the latter two manures did not give any increased return over the pure nitrogen plots. In the spacing experiment 3 feet to 5 feet spacing was found to be the best in both Fiji B and Co. 281. It was learnt that the practice of ratooning was unsuitable for the tract although the indication was that thin canes ratooned better than thick canes. In this tract restricted irrigation did not give a favourable yield.

(9) Miscellaneous crops.

23. (i) *Soya Beans* (*Glycine soja*).—At Samalkot, Kachin and PeNgpye yielded 1,255 lb. and 377 lb. respectively per acre. On the Central Farm, many varieties were tried but five gave the best yield varying from 780 lb. to 1,400 lb. per acre. The two varieties mentioned above were grown under dry conditions at Nandyal and gave good yields and appear to be getting acclimatized. At Hagari, the crop had been under trial for three years but this year '*surul*' destroyed it completely under rainfed conditions, but sown early in the *mungari* season under irrigation it yielded at 138 lb. per acre. In view of the popularity of this crop, further trials will be conducted next year.

(ii) *Redgram* (*Cajanus indicus*).—Twenty-seven cultures were under comparative trial at the Cotton Breeding Station, Coimbatore. Selections from Gujarat, Dharwar and local types showed promise, some of them being very early. Inheritance of seed coat colour was under study.

(iii) *Bengalgram* (*Cicer arietinum*).—The mode of inheritance of seed coat characters was under investigation. When varieties which threw out mutants in the previous years were

sown in the following year, most of them continued to mutate in the same directions. At Nandyal, four strains, Nos. 215, 330, 331 and 355 were under comparative trial but the results were inconclusive. Pusa types only flowered but did not set pods. At Koilpatti, two strains, Nos. 468 and 482 from the Cotton Specialist were promising.

(iv) *Cowpea* (*Vigna catiang*).—At the Millet Breeding Station, Coimbatore, this crop was under study both as rainfed and hot weather crops. Five hundred and fifty single plant selections were grown. Of the varieties under trial, 160 types have been marked out.

(v) *Dolichos Lablab*.—Four selections were under comparative trial at the Millet Breeding Station of which D.L. 89 and D.L. 231 were found to be the best.

D. Horticulture.

24. Horticultural work is confined to two stations at Ootacamund and Coonoor. At Ootacamund, cross-breeding experiments in Watsonia and Primulas were continued. Medicinal plants like *Jalap*, *Pyrethrum*, *Lobelia inflata* and *Barosma betulina* were under trial. Edible lupin varieties including one from Russia were cultivated. A herbarium for the annual and perennial plants growing in the Botanic Gardens, Ootacamund [illegible] during the year. At Sim's Park, Coonoor, [illegible] were introduced this year. The nine surviving [illegible] are making satisfactory progress. One hundred and ten standard roses were budded.

E. Implements.

25. The engineering section was engaged in designing and improving indigenous agricultural implements and machinery. Cooper No .34, similar in pattern to Cooper No. [illegible] but of greater capacity was very well reported upon in districts and is priced at Rs. 9 f.o.r. any railway station in the Presidency. A chain ridging plough intended for garden crops like cotton, chillies, etc., was made and is sold by Messrs. P.S.G. & Sons, Coimbatore, and Cooper Engineering Works, Satara. It is estimated that nearly 3,000 iron ploughs were sold throughout the Presidency during the year. Among water-lifts, Persian wheels are finding favour among ryots. An improved type of the circular mhote is available for sale at Messrs. P.S.G. & Sons, Coimbatore. The turmeric polishing machine was demonstrated in Gobichettipalaiyam and Erode taluks of Coimbatore district and has found favour among ryots. During the season, four machines were demonstrated and 200 tons of turmeric were treated. A leaflet on this has been prepared for publication. Two Indian-made chaff-cutters have been found to compare favourably with English makes except for one or two minor defects. A grain polishing machine and a wet land puddling implement were also

under trial. Several designs of bullock harness were made at the workshops and distributed to agricultural stations. The reports about them are very encouraging. A Japanese paddy huller was under trial. It hulls about 100 lb. of paddy in an hour, although the operation to be complete has to be done twice. Four men are required for operating the machine. The Research Engineer was helpful to several officers and others in regard to manufacture and trial of different kinds of machinery.

F. Livestock.

26. Although cattle are maintained in several agricultural stations for purposes of breeding, the main work of the livestock section is confined to the cattle farm at Hosur. The number of livestock on this station was 697 as against 634 the previous year. Of these, 123 were bulls, 317 were cows and heifers, 170 young stock and 57 work animals. Four important herds are maintained on the station.

(i) *Cross-bred herd.*—Cows and heifers of this herd are mated to Scindhi bulls with a view to breed back to the indigenous breed. These cows are mainly maintained for the supply of milk at the Agricultural College Dairy so that inter-transfers take place periodically. Young stock are kept at Hosur for rearing. Some of the seven-eighths and three-fourths Scindhi graded bulls are available for stud purposes in towns where milk is the chief object. There were only six cows in milk in the year which produced on the average 13·3 lb. per cow per day. At the Agricultural College, Coimbatore, 19·4 cows were in milk giving a daily average yield of 15·2 lb. of milk per cow. The average would have been higher but for the prevalence of foot and mouth disease in the herd in December. Three best cows in the herd, namely, Nos. 303, 322 and 323 gave a yield of 10,512, 9,142 and 9,008 lb. respectively in their lactation.

(ii) *Scindhi herd.*—There are 170 breeding animals in the herd. The demand for this breed continues in several parts of the Presidency. The 36 cows in milk produced milk which gave a daily average of 12·5 lb. per cow. There are 42 farm-bred cows whose yield of milk per lactation worked out to more than 4,000 lb. or 12·3 lb. per day per cow. There are in this herd 11 cows which yielded from 5,000 to 7,000 lb. during the lactation.

(iii) *Kangayam herd.*—There were 317 animals in the herd. Fifty-nine cows were in milk throughout the year which gave an average of 7·2 lb. per cow per day. There were 12 cows whose average yield was between 3,000 and 4,000 lb. The maximum yield of the best milker in the herd was 16·5 lb. of milk per day.

(iv) *Hallikar herd.*—The number of breeding stock was 37. 12·7 cows were in milk on the average which yielded 6·6 lb. per day per cow.

(v) *Ongole herd.*—These were maintained at Guntur Agricultural Station. 11·7 cows were in the herd but on the average only 6·9 cows were in milk which yielded at 12 lb. per day per cow as against 10·1 lb. last year. The best Ongole cow in the herd yielded 5,139 lb. which worked out to a daily average of 15 lb.

(vi) *Buffalo herd.*—In Guntur, four Delhi buffaloes were under milk. The daily average per buffalo was 20·3 lb. of milk as against 14·6 the previous year. The best buffalo in the herd which completed her lactation gave 7,072·7 lb. with a daily average of 19·3 lb. which may be considered as quite good.

At Hosur, 44 bulls, 33 cows and 3 calves were sold for breeding purposes.

Proposals for the opening of a buffalo station at Prattur and another for Ongole cattle at Lam, both in the Guntur district, are under the consideration of Government.

Bellary sheep.—There were 123 sheep of the Bellary breed. The yield of wool was 2·15 oz. The yield of the best ram was 5·2 lb. and that of the ewe 4 lb.

Poultry.—Imported flocks of White Leghorn, Rhode Island Red, Light Sussex and Black Minorca and two indigenous breeds, Chittagong and Tellicherry, were maintained. There were in all 437 birds at Hosur. 92·5 hens produced on the average 15,709 eggs with an annual average of 169·8 as against 133·1 per bird last year. The maximum individual yield of a hen of White Leghorn was 248, of a Rhode Island Red 269 and of a Black Minorca 220. The maximum of others was below 200. The percentage of hatchability came to 57·1.

Besides those at Hosur, 735 birds were maintained in seven other agricultural stations in the Presidency. Although they are popular and there is a big demand for them diseases break out in a virulent form and take a very heavy toll. At Anakapalle and Kalahasti, a very large number of these birds died in a very short time owing to the attack of Pseudo-fowl pest.

G. Plant Pathology.

27. Under this head will be discussed the work of the Entomological and Mycological sections which respectively deal with insect pests and diseases of plants. It is not always possible to suggest effective curative treatment for all the ailments of plants. Therefore other methods should be evolved. One line of attack is to evolve plants which are resistant to diseases. As has been pointed out elsewhere in the report, this is the work of the breeder. In the case of insects, another way is to introduce natural insect enemies which attack them and keep them under control. All these methods were attempted during the year. Much attention was paid to combat pests of sugarcane,

like moth borers and mealy bugs. The moth borer is a serious pest attacking both young and grown up canes. Six different larval parasites have been noticed and a detailed study of some of these is in progress. The method of control of mealy bug is under investigation. It has three natural enemies, a lady bird, a fly and a chalcid. In paddy, swarming caterpillar, stem borer and paddy grasshopper were under investigation. Among fruit pests, special attention was paid to fruit flies. A capsid bug found to do considerable damage to tender shoots, leaves and fruit of guava, another doing damage to orange and pests on pomegranate and fig were under study. Cholam earhead bug does considerable damage just at a time when the head is forming. It was found that sulphur gave useful results. An attempt was made to find out the number of dustings necessary and the time at which it should be dusted. But the incidence of the pest being very light this year, yields of the plots were not significant. In regard to pests of stored products, observations in different strains of paddy and millets were made. While G.E.B. 24, A. 1, A. 3, A. 5 and M. 5 showed varying degrees of resistance to the paddy borer, millet strains A.S. 367, A.S. 809 showed more susceptibility to weevil attack than A.S. 29 and A.S. 1575. This indicates that breeding will have to be developed in yet another direction, namely, in producing strains whose seed would be resistant to the attack of weevils.

In regard to fungus diseases, field experiments designed to study the effect of nitrogen, phosphoric and potash and their combinations on the incidence of foot-rot of paddy indicated that nitrogen either alone or in combination with other manurial ingredients produced significantly higher percentage of disease than a basal dressing of farm-yard manure, used as con- trol. G.E.B. 24 which is highly resistant to paddy blast on the plains showed infection on the hilly tracts of Wynaad and Coorg. There was a severe outbreak of Mahali or Koleroga dis- ease on areca palm in South Kanara district during the year. Very heavy losses were incurred by arecanut growers. Although it has been found from experience that spraying with Bordeaux mixture was an efficient remedy, in view of the seriousness of the disease it was considered necessary to find out whether there are any missing links in the chain of our investigation. Whether the fungus cannot grow or multiply in the soil or on decaying organic matter used as mulch in arecanut gardens and thus be the the means of spreading the disease from one garden to another and from one season to another was a point for investigation. Researches in this direction showed that the resting conidia remained viable in the soil of the infected gardens but that the fungus could not grow or multiply in the soil as germinated conidia produced mycelium but not sporangia. The study of the flight of resting conidia with the aid of an aeroscope showed that conidia would be trapped at a height of 32 feet about ground level. Further studies on this disease are in progress.

The study of ' black shank ' on tobacco was continued. A newly recorded disease on coriander, wilt on redgram, cotton and bananas, *sclerospora* disease of cereals, and cereal rusts were other diseases under investigation.

The mosaic disease of sugarcane to which reference has been made in previous reports was further studied. Of 17 varieties under study, Co. 422, Co. 434 and Uba proved highly resistant while the infection on the control was as high as 70 per cent. Several suspected cases of mosaic on potato at the Nanjanad Research Station were under examination.

H.—Trial plots.

28. The necessary corollary to the research work done on the agricultural stations is the trial in ryots' lands of such of the items as have given promise in the agricultural stations. These trials are held generally for three years and any extra cost in connexion with running such experiments is borne by Government though the land is placed at the disposal of the department by the ryots. There were 902 trial plots in paddy, ragi, sorghum, groundnut, cotton, sugarcane, cumbu and bengalgram as against 913 in the previous year.

Paddy.—In the Vizagapatam district ten strains of paddy gave an increased yield of 10 to 15 per cent over the local. *Mypali* 7, *Mypali* 30, *Konamani* 3 (*a*), and *Gunupur Sannam* No. 47, gave respectively 10 per cent, 15 per cent, 12·8 per cent and 10·9 per cent increased yields over local varieties. In the Guntur circle No. 3269, a strain in *Vankasannam* gave 10 per cent increase over Maruteru 8, the best so far released in the same variety. Adt. 11 and A.E.B. 65 when compared with local varieties gave a 5 per cent increase during the last two years. In the Trichinopoly district, Adt. 4 mutant when compared with Adt. 3 gave 10 per cent increased yield, but was 7 to 10 days longer in duration. In Tanjore district, however, the strain failed having been caught in the rains. Mention has been made elsewhere in the report in regard to strains resistant to *Piricularia* fungus. The disease not being severe during the year, results were inconclusive. The strains gave 12 to 20 per cent lower yield. Adt. 12, a strain of *Chitrakali* when compared with *Sarapalli* gave a 13 per cent increase in yield but was 10 to 15 days longer in duration.

Sorghum.—There were 17 trial plots in Kurnool and Cuddapah districts. Two strains, No. 28/3 and 224 showed themselves superior to old selections or local varieties by giving from 23 to 41 per cent more than them.

Groundnut.—A.H. 25 has done well in almost all places tried. It gave 20 per cent, 24 per cent and 62 per cent increases in Trichinopoly, Guntur and Madura circles when compared with local varieties.

Ragi.—In the Vizagapatam district, ragi No. 525 gave a 14 per cent increase over the local variety, while E.C. 593 in Tanjore district gave 8 to 11 per cent increase over the local.

Cotton.—Cocanada 171 and Cross 20 were compared with each other during the last two years; while no difference was found last year, Cross 20 gave a 12 per cent increased yield this year. In the Nandyal tract, three strains gave from 35 to 46 per cent increase over N. 14, the old type but the quality of lint was a little inferior.

Sugarcane.—When P.O.J. 2878 was compared with J. 247 in the Vizagapatam district, the former gave an increased yield of 14·7 per cent over the latter. In Trichinopoly circle, Co. 281 and Co. 285 were compared with each other. The former gave a 6 per cent increase over the latter.

Cumbu.—In the first circle, Punjab and Poona varieties gave an increase of 22·6 and 21 per cent respectively over local varieties.

Bengalgram.—In the fifth circle, strains 468 and 482 were compared with the local variety. While the local variety was subject to wilt disease, the strains were resistant to it. Season being bad, no conclusive results could be obtained in regard to yield.

V.—Demonstration.

29. The number of central villages in which the demonstration staff worked in each taluk remained the same as in last year. Demonstration plots with a view to show improved methods of cultivation on important crops like paddy, sugarcane, groundnut, plantain, cotton, etc., were laid down in ryots' own lands in comparison with local methods. There were, during the year 7,554 such plots as against 7,214 in the previous year. Invariably these plots showed clearly the advantages of the methods recommended.

Reference was made last year to the attempt made in intensive propaganda by the appointment of 63 demonstration maistries in nine taluks of the Vizagapatam district. This is the second year of the working of the scheme.

Apart from demonstration work of the department, the services of these maistries were utilized in the general uplift of the rural population by inculcating in them ideas of better living. This connotes improvement in their social and economic condition. This was attempted by tackling problems of sanitation, revival of cottage industries and improving social customs and moral standards. A comparative statement showing the extent of agricultural improvements effected in 1936–37 as compared with that

of previous two years, in the taluks under the scheme is given below :—

Improvements.	1934–35—(31 centres provided with demonstration maistries or demonstration coolies).	1935–36.	1936–37.
	ACS.	ACS.	ACS.
1 Introduction of improved varieties and strains of paddy.	96,313	72,515 *	97,877
2 Planting thin sown seedlings ..	42,643	29,496 *	55,969
3 Green manuring	23,811	4,768 *	12,687
4 Introduction of Co. 213, sugarcane.	1,534	4,452	6,297
5 Introduction of other improved varieties	63	195	399
6 Wider planting in lines	4,641	3,370 †	6,814
7 Interculturing by bullock power ..	381	838	1,826
8 Planting with improved sugarcane seed material.	3,635	5,374	5,898
9 Ragi strains	564	628	1,048
10 Grading jonna seed	30	563	981
11 Treatment of jonna seed against smut.	57	602	658
12 , Groundnut—Sowing in every furrow.	1,343	2,859	7,041
13 Cultivation of plantains on improved lines.	607	555 ‡	571
	No.	No.	No.
14 Improved furnaces constructed ..	123	465	681
15 Iron baded sugarcane mills	44	292	228
16 Properly covered manure heaps and pits.	4,185	17,115	20,501
17 Conservation of urine in manure heaps.	2,250	6,829	10,168
18 Composts	435	454	875
19 Sale of Cooper No. 11 and Gujarat ploughs.	315	492	546
20 Pests and diseases tackled (excluding smut in cholam).	252	664	1,093
21 Bee-hives maintained	2	4	28
22 Sale of improved birds	36	387	752
23 Sale of poultry	16	85	337
24 Donors for breeding bulls	..	..	36
25 Demonstration plots	654	1,582	1,128
26 Trial plots	76	237	354

Of the 63 demonstration maistries employed at the commencement of the scheme, 25 had to be replaced owing to death, resignation or removal for inefficiency and the work was, therefore, seriously handicapped. It may, however, be noted here that though all the demonstration maistries have not come up to the standard expected, they have been able to bring the department and its activities to the notice of a large circle of ryots in the villages they were working.

* 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 Yellamanchilli sub-circle, on account of competition from East Godavari.

Exhibitions and shows.

30. Much importance is attached to the educative value of exhibitions. Incidentally they bring the demonstrators into touch with villagers who live beyond their centres of activity. Hence, advantage is taken of major festivals, and other important functions to which rural folk are drawn in large numbers. There were 297 exhibitions as against 195 in the year previous. A large scale exhibition was conducted at Madras during the annual Park Fair celebrations. Two big exhibitions, one at Srirangam during the Vaikunta Ekadasi festival and another at Tiruvadi were held. An innovation at these exhibitions was the staging of agricultural dramas drawing pointed attention to drawbacks in certain local systems, at the same time suggesting methods to overcome the defects. Methods of improving villages were also shown at such exhibitions by putting up model village houses with all the necessary equipment in the shape of sanitary cattle sheds, poultry yards and apiaries. Practical demonstrations of improved implements and machinery were also held. With a view to give wide publicity to the new farm recently opened at Pattukkottai and to acquaint the ryots of the Cauvery-Mettur Project area, with the work in progress, an agricultural show was held on the farm, when sugarcanes grown in the tract were exhibited and the manufacture of cream jaggery demonstrated. Generally, the attendance at these exhibitions and shows was good and had the desired effect of creating an interest among ryots in agricultural improvements.

Exhibitions, conferences, jamabandi camps and similar gatherings were taken advantage of for giving 1,210 talks to village folk. Lectures in elementary agriculture were delivered in the Y.M.C.A. summer school of rural service held at Sulur in Coimbatore district for five weeks in April and May 1936.

The three motor exhibition vans toured throughout the Presidency in all the circles except the Nilgiris.

Items of propaganda.

31. Propaganda was carried out in improved methods of cultivation of different crops, supply of better seed material, introduction of new crops, use of improved implements, methods of manuring, grant of takkavi loans, improvement of livestock, timely control of pests and diseases and side-lines to farming.

(1) Crops.

(*a*) *Methods of cultivation and manufacture—Paddy.*—As mentioned in previous reports, the main cultural improvements advocated in paddy are reduction in seed rate, transplanting as opposed to broadcasting, and early and efficient tillage of seed beds. Notwithstanding the fact that fall in prices of paddy has made its cultivation unremunerative, there is no gainsaying the fact that it is not so easy to replace it by suitable cash crops.

One way of tackling the problem seems to lie in the direction of reducing the cost of cultivation. For example, light iron ploughs for cultivating paddy land were demonstrated in the light soils of Nellore district which brought in a net profit of Re. 1 per acre. Thin sowing of seed beds has a similar effect. This has become the general practice in the V circle which, in the main, is a paddy tract.

Sorghum.—Light iron ploughs and H.M. guntakas (blade harrows) were demonstrated for preparing land for sowing sorghum in the place of country ploughs and local guntakas and were shown to be more economical in cultivation.

In sugarcane, McCormick Deering cultivators and H.M. guntakas used for inter-cultivation in the II circle showed a saving of Rs. 4 per acre over local method of ploughing. A light steel ridger employed for ridging sugarcane fields as against the employment of manual labour brought in a saving of Rs. 3-11-0 per acre, the cost of the ridger being only Rs. 10-8-0. Production of vigorous seed material by raising " short crop " is becoming increasingly popular in the Vizagapatam district. It is also being taken up in the IV circle The practices of trench and line planting are being followed in the VI and VIII circles. Planting canes 3 feet apart between lines instead of 2 to 2½ feet in the III circle resulted in saving of seed. Ryots adopted wider planting in 1,400 acres in the Bellary district as compared with 537 acres in the previous year. The total area in the Presidency under improved methods of cultivation in sugarcane is estimated at 34,000 acres.

With regard to propaganda in the manufacturing side, 1,833 improved furnaces were constructed. Five hundred and sixty-eight demonstrations on the preparation of good jaggery were arranged, about 130 of them being on " cream " jaggery. In the I circle alone, 257 improved mills and 10 power crushers were introduced during the year. In all, 293 mills were sold in the presidency through the assistance of the department.

Cotton.—Line sowing is an improvement recommended wherever Cambodia cotton is sown. In view of low prices offered for sugarcane and jaggery in the IV circle, the area under cambodia has increased to 9,000 acres. Drill sowing is adopted in the VI circle, but the area under it varies according to conditions of season. The area under departmental improvements in cotton was 29,124 acres as against 23,672 acres last year.

Fruits.—Improvements suggested in the cultivation of fruit are in the direction of improved system of irrigation as well as in the correct methods of pruning, inter-cultivation, manuring, spacing, and control of insect pests and diseases. In the II circle, 363 acres were inter-cultivated with improved implements and 872 acres were manured with green manures, oil-cakes and phosphatic manures.

Groundnut.—The use of H.M. guntaka for lifting groundnut was demonstrated which indicated a saving of Rs. 1½ to Rs. 4 per acre. The method of sowing groundnut in every furrow instead of sowing in alternate furrows was largely adopted in Vizagapatam district, where 12,409 acres were sown in this method as against 3,802 acres in the previous year.

Coconut.—The items of improvement recommended in this crop are inter-cultivation, raising green manure crops, applying bone-meal, use of good seed material and proper spacing in new plantations.

(*b*) *Methods of manuring.*—The introduction of green manuring either for paddy or sugarcane is intimately associated with the vicissitudes of season. Occasional showers of rain during the dry summer months are the limiting factor to its successful introduction. Another obstacle in the way is the absence of control against cattle trespass and ravages of insect pests. In view of these limitations, the area under this improvement is not as extensive as one would wish. About 189,019 acres are estimated to be under green manures as against 167,233 acres last year.

The presence of sugar factories has augmented the use of chemical manures either pure or in combination with organic manures. These have an immediate effect of increasing the tonnage of sugarcane. Phosphatic manures like bone-meal, Trichinopoly phosphates and fish guano were recommended to be applied in combination with green manures. A special manure mixture for potato was recommended by the department and manure firms took advantage of the advice of the department for preparing such mixtures. The department does not stock chemical manures but confines itself to giving suitable advice. From reports received, it is learnt that chemical manures have been applied over an area of 43,722 acres of paddy and 10,270 acres of sugarcane.

(*c*) *Seed distribution—Cotton—*(*a*) *Cambodia cotton.*—In view of its good staple length and yield, this cotton is gaining popularity throughout the presidency wherever irrigational facilities are available. Strain Co. 2 continues to be popular although as has been stated elsewhere in the report steps are being taken to replace it by other better strains which would, however, take some time to displace it. In all, 249,355 lb. of seed of this strain were distributed during the year for seed purposes of which the VIII circle alone was responsible for nearly 148,000 lb. The Tiruppur Co-operative Trading Society also produced a large amount of seed of this strain and distributed in and outside Coimbatore district. In the VIII circle, it is estimated that 1½ lakhs of acres are now under this strain. In the VI circle, there were 221 acres under seed-farms. A ryot in Manaparai in the V circle, ginned at the instance of the department cotton kapas and reserved nearly 20,000 lb. of Co. 2 seed for distribution among ryots. In this presidency, 206,550 acres were under this strain as against 213,339 in the previous year.

(*b*) *Karunganni cotton.*—This cotton is grown in the V, VI and VIII circles. There were 1,946 acres under seed-farms for production of good seed, and 60,624 lb. of seed were distributed. The strains that are recommended are K.P.T.1, C.7 and A.10. It is estimated that 165,440 acres were under this cotton as against 182,255 acres last year.

(*c*) '*Westerns*' *cotton.*—This cotton is confined to the III circle, N. 1 being the strain that is under distribution. There were 2,554 acres under seed-farms which were sufficient to meet the requirements of the circle. One hundred and forty-eight thousand eighty-seven pounds were distributed as against 69,520 lb. in the previous year. The quantity distributed varies according to the previous season and market demands; it is reckoned that the increased return obtained by growing this strain is Rs. 2-8-0 per acre. There are about 239,500 acres under the strain.

(*d*) '*Northerns*' *cotton.*—In view of the gradual improvement in price of 'Northerns' during the last two years the cultivation of strain No. 14 was pushed through in places where it was once popular. As has been stated before, this strain can be successfully cultivated only in certain localities and steps were therefore taken to encourage the sowing of this strain wherever it could be profitably grown. Efforts are being made, however, to find a more cosmopolitan strain suited to the local conditions of soil and rainfall. About 12,730 lb. of seed were obtained from 78 acres of seed-farm. The area under this cotton is 3,925 acres.

Coconut.—The rise in price of coconut during the year helped ryots to bestow greater attention on manuring and cultivation. The favourable summer rains contributed to increase in yield and harvest was plentiful. During the year 13,390 seed nuts and 8,202 seedlings were supplied. An Agricultural Demonstrator deputed to the Laccadive Islands inspected the work of the three demonstration maistries employed and marked out 122 good coconut trees for collecting seed nuts.

Groundnut.—In the II circle, 35,816 lb. of improved seed in both spreading (A.H. 25) and bunch (A.H. 45) varieties were distributed during the year. In the VIII circle, A.H. 25 with yields ranging from 30 to 100 per cent over local groundnut was in great demand. This is an important crop in the IV circle where it is, in some cases, replacing sugarcane in view of low prices. The demand for A.H. 25 was good; 10,223 lb. were distributed. In the presidency, 22,793 lb. of seed were distributed during the year.

Paddy.—In the I circle, there were 3,072 acres under seed farms and the total area under improved varieties of paddy including the natural spread amounted to 307,030 acres as against 210,688 acres last year. About 168 tons of seed is expected to be available for seed distribution in the coming year. As there is no agricultural station in the II circle, strains from Maruteru and Samalkot were introduced some years ago. There were

182,445 acres under these strains distributed by both the department and ryots. Seed farms to the extent of 2,174 acres were put down from which it is expected to obtain 408 tons of seed for distribution next year. In the III circle, the area under G.E.B. 24 has spread so widely that the need for sale of seed departmentally has almost disappeared. In the IV circle, 42,544 lb. of departmental strains were distributed during the year.

In the V circle, through the existence of the Aduturai Agricultural station it has been possible to release strains for almost all the main varieties of paddy. Seeds obtained from these strains are distributed to seedsmen on condition that they distribute at least half of their produce as seed to their neighbouring ryots. Fresh seed is supplied every year from the research station to such seedsmen in order to maintain the purity of the strain. Arrangements have also been made whereby ryots go straight to the seedsmen instead of applying to the demonstrators for seed. This method has resulted in developing large quantities of good seed without much expense to Government. Great care on the part of district staff is, however, necessary to see to the maintenance of purity of the seed. It is hoped that other circles will be able to follow the lead given by this circle in this very important matter.

Nearly 750 acres of seed-farms were maintained in the VI circle in improved strains like G.E.B. 24, Co. 2, Co. 8, and Adt. 11. In the VII circle, 36,697 lb. of different strains from Pattambi were distributed, apart from 15,000 lb. of bulk seed of some important varieties. In the VIII circle, 25,169 lb. of seed of G.E.B. 24, Co. 1, Co. 2, Co. 3 and Co. 6 and Adt. 11 were distributed. The total area under different strains in the presidency including the natural spread is estimated to be 1,395,043 acres as against 1,277,583 acres in the year previous.

Pepper.—Similar to last year, propaganda in pepper cultivation was extended to South Kanara district where 28,500 cuttings of selected vines were supplied to ryots. In Malabar, the season was poor and price low; the demand for cuttings in consequence was limited.

Potato.—Great Scot is the most popular variety on the Nilgiris. It is, to a limited extent, followed by Ben Cruachan which is a better yielder. Under seed-farm conditions in 41 villages 31,475 lb. of potato seed were issued. The average yields ranged from 400 to 600 maunds in the early, 700 to 900 maunds in the main and 400 to 600 maunds in the second-crop seasons. In Salem district, 3,230 lb. of Great Scot were distributed. The area under improved varieties on the Nilgiris is estimated at 12,068 acres and the total quantity of seed distributed in various circles amounted to 69,047 lb.

Ragi.—Fifty-seven acres in the Vizagapatam district were under strains evolved at the agricultural station, Anakapalle. The natural spread in them is over 1,000 acres. E.C. 593 has spread

in the III, IV and VIII circles. In the presidency, 10,577 lb. of improved seed were distributed and the area under them is estimated to be nearly 16,000 acres.

Sorghum.—The area in the III circle under improved strains of sorghum is estimated to be 23,000 acres. Strains, A.S. 2095, A.S. 367, A.S. 1575 and A.S. 809 are also finding their way in the VI and VIII circles. The total seed distributed in the presidency amounted to 16,333 lb.

Sugarcane.—In the Vizagapatam district, setts sufficient for 962 acres were supplied from seed raised as "short crop." In the II circle, the existence of Vuyyuru sugar factory has stimulated to the area under sugarcane. But owing to difficulties in regard to transport and want of sufficient capital for purchase of manures, the area under sugarcane is said to have gone down to 2,000 acres, while in Guntur district which has hitherto maintained its normal area, owing to fall in the price of jaggery, the area during the last planting season is said to have been reduced by about 25 per cent. Co. 213, Co. 281, P.O.J. 2878, and J. 247 are popular varieties in the IV circle. In the V circle, though the area under cane is small, 380 acres which form nearly a third of the total area are under improved varieties. The sugar factory at Nellikuppam purchased cane from Kumbakonam and Shiyali taluks. Improved varieties are also spreading slowly in the VI circle, while in the VII circle, Fiji B is slowly replacing Red Mauritius which has badly deteriorated. Varieties like Co. 213, Co. 219, Co. 290, Co. 413 and Co. 419 are popular in Coimbatore circle. The total area under improved varieties in the presidency is 42,650 acres as against 39,597 acres the previous year.

Tapioca.—In the VII circle, improved varieties like butter stick are replacing old ones. In about 34 acres, 131,200 cuttings of improved varieties were planted.

Tobacco.—In the II circle, cigarette tobacco varieties are spreading. Two-thirds of the area of tobacco in Guntur district and about a third in the Kistna district are under this type. H.S. Nos. 8 and 9 evolved at the agricultural station, Guntur, are spreading.

(2) Fodder.

32. In all circles, the question of introducing suitable fodder crops is always borne in mind. New fodder crops like *pillipesara*, teosinte, *kollaganjaru*, and lucerne were introduced in several circles. Stimulus is also given to the spread of grasses like *kolukattai*, elephant and guinea, besides the introduction of strains like T. 1, T. 6, and T. 12. The Madura Municipality maintained a sewage farm where a large area is under guinea grass. Silage making was demonstrated in fodder crops and hill grasses. Hay making demonstrations were made in the VII circle. In the presidency, apart from 171,150 slips of elephant and guinea grasses, 9,569 lb. of seed of various fodder crops were distributed during the year.

(3) Fruits and Vegetables.

33. In the I circle, about 3,300 acres of plantain were introduced through departmental efforts. In Kumbakonam, a nursery started during the year was able to dispose of 2,000 grafts. The planting of cashewnut received a large impetus. Waste lands in Malabar and South Kanara are being planted to this crop. During the year, 2,214 lb. of selected seed were supplied and about 1,000 acres are under it. During the year, 78,083 grafts of mango, citrus and sapota, 58,454 pine-apple suckers and 6,313 plantain suckers were supplied.

In view of its nutritive value, tomato is being recommended in different parts of the presidency, especially in the III circle. The cultivation of other vegetables like brinjal, beans, radish and carrots was also encouraged in different circles, the demand for such seed being met by nurserymen in Poona and Rajahmundry.

(4) Implements.

34. The noteworthy event of the year was the sanction by Government of a special grant of Rs. 30,000 for the equipment of depots. This money was mainly utilized for purchase of different types of implements intended for exhibition and demonstration. In order to keep the depots always open which, in the past, was not possible, Government also approved of the scheme of employing store clerks in all depots though only a few were employed at the close of the year. It is hoped that when all the demonstrators are assisted by store clerks it would be possible for them to utilize most of their time in villages among ryots unhindered by routine scriptory work. Further, fully equipped depots would, it is hoped, increase the contact between demonstrators and villagers and assist in improving mutual relationship between the two.

There were, during the year, 17,891 demonstrations in various implements and machinery. Of this, over 9,000 demonstrations were with improved ploughs. A list of the more important demonstrations held and number of implements sold is given below :—

	Number of demonstrations held.	Number of implements sold.
Ploughs	9,165	2,918
Guntakas	1,458	20
Mhote wheels	1,265	413
Bund forming implements ..	329	24
Planet junior hoes	348	37
Buck scrapers	151	6
Chaff cutters	63	9
Seed drills	225	313
Sprayers	1,297	172
Spare parts for ploughs ..	..	4,528
Sugarcane mills	..	293
Other implements	1,416	231

Demontsrations were also given in rubber-tyred carts and turmeric polishers in the VIII circle. Roll easy mhote wheels were the main feature of demonstration activities in arecanut gardens on the west coast. The ryots were impressed with the relief that these wheels gave to their puny and weak cattle.

(5) Livestock.

35. Propaganda in the improvement of cattle by better methods in breeding, feeding and management was continued throughout the presidency. An impetus was given in this direction by the appeal of His Excellency the Viceroy. Many district boards which formerly evinced little or no interest vied with one another in their anxiety to obtain grants from Government for the purchase of breeding bulls. The district boards of Coimbatore and Tanjore, obtained sanction of Government for purchase of bulls under the contribution scheme. The number of breeding bulls maintained under the premia scheme including those in the contribution scheme was 178 as against 140 in the previous year. Of this number, Coimbatore, was responsible for 60 bulls.

Poultry.—The unabated interest that ryots continue to evince in poultry farming as a side line to agriculture indicates that immediate steps should be taken to place this industry on economic and profitable lines. Unfortunately, diseases which are rampant at certain seasons of the year for which control measures are yet unknown make ryots and others interested in them extremely despondent. In spite of this disability, the progress in the introduction of eggs and improved poultry has been maintained. Missionary institutions often come to the aid of Government in maintaining high class poultry. Special mention may be made of Mr. DeValois of the American Mission, Katpadi, who runs poultry on up-to-date and scientific lines. He has been promised by Government a subsidy of Rs. 3,000 for three years on the recommendation of the District Economic Council of North Arcot. As against 694 chicks and 3,651 eggs distributed last year, 1,178 birds and 3,969 eggs were issued during the year under review.

Apiary.—This is another side industry which is becoming increasingly popular. Great progress is noticed in the I, V and VIII circles. As a result of intensive propaganda throughout the presidency, 1,614 bee-hives were maintained of which Coimbatore circle takes credit for half the number.

(6) Loans.

36. Takkavi loans were granted during the year to ryots to the extent of Rs. 16,660 for the purchase of agricultural implements

mentioned below as against Rs. 15,910 granted in the previous year :—

Description.	Number.
Ploughs	1,785
Blade harrows, drill sets, hoes, cultivators, buckscrapers, ridgers and bund formers ..	123
Mhote wheels	336
Chaff cutters	2
Sugarcane crusher	1
Sprayers	46
Spares for ploughs	260
Miscellaneous such as digging forks, secateurs, etc.	4

The special feature during this year was that with the exception of one sugarcane crusher and accessories for jaggery making, the whole amount was spent on loans for the purchase of small implements which showed that the purpose of the loans was well served.

The loan rules were amended during the year so as to include water lifts and appliances for the control of plant pests and diseases such as sprayers and dusters within the scope of the objects for which loans could be granted. The procedure of granting loans for implements costing over Rs. 25 was also changed authorizing officers of the Revenue Department to deal with the applications for such loans obtained and forwarded by the officers of the Agricultural Department. The officers of the Revenue Department are to sanction the loans after due enquiry, and send the amounts to the officers of the Agricultural Department who in turn will arrange for the purchase and supply of the implements to the applicants. It is too soon to give any opinion on the working of the new system.

(7) Manures.

37. *Farmyard manure.*—Propaganda on proper conservation of cattle manure is insistent. Enthusiasm on the part of the ryot wanes during busy seasons of sowing and harvest but the existence of several thousands of manure pits maintained on improved lines is an indication that some ryots at least do believe in their efficacy. In the I circle, there were 2,817 such manure pits. The number maintained in all circles under different methods during two years is given below :—

	1936-37.	1935-36.
Manure pits	37,799	28,586
Dry earth sheds	13,852	10,516
Loose boxes	60	42

Compost.—Some municipalities are interesting themselves in the conversion of nightsoil into pouderette. The Karur Municipality issued free manure made from composts to selected ryots for trial and the results are reported to be encouraging. In the VII circle, water hyacinth, a pest under the Madras Agricultural Pests and Diseases Act, in Palghat and Ponnani taluks was composted into manure. The total number of composts made during the year was 1,792 as against 1,683 in the previous year.

Green manures.—In the V circle, apart from individuals, co-operative societies are taking interest in the sale of green manure seed with the result that very large quantities are being disposed of by them. The same circle supplies wild indigo and sunnhemp to other circles. Dhaincha, sunnhemp, wild indigo, indigo, *pillipesara*, and cowgram were recommended as suitable crops for green manuring with the result that 129 tons were sold by the department while other agencies disposed of 270 tons.

Artificial manures.—As stated elsewhere, the activities of the department were merely advisory in regard to methods of application, kinds and quantities of artificial manures that are on sale.

(8) Pests and Diseases.

38. An outstanding feature of propaganda work done during the year was in connexion with a severe outbreak of Mahali disease in arecanut gardens in South Kanara. This disease took a very serious form and penetrated into places where it had never been found before. This scourge affected particularly certain classes of very poor people to whom the proceeds of the crop were their only sustenance. Special inspections through the affected areas were made by officers of several departments and the methods of controlling the disease were gone into carefully. Every attempt was made to satisfy the great demand that existed for sprayers and chemicals. Government sanctioned a special staff of two agricultural demonstrators, 10 fieldmen and 30 climbers to meet the situation and to demonstrate sanitary measures. Sixty tons of chemicals and 800 sprayers of different makes were made available to ryots. The special staff visited 2,797 gardens in 162 villages, operated 89,755 trees and held 1,061 spraying demonstrations. They were also told what precautionary measures should be taken to see that, in future, the disease does not repeat itself with the same intensity as it did this year. A co-operative society consisting of garden owners and others was started at Puthur with a view to control the disease and be of assistance to the poor and needy among them. During the year, 2,795,527 trees were treated both in Malabar and South Kanara districts.

Nephantis serinopa, an insect pest on coconut, was found in three villages in Kurumbranad and Chirakkal taluks of Malabar. Remedial measures were demonstrated on 4,982 trees. A special assistant was deputed to control the damage caused by grasshoppers in Arantapur district. Demonstrations were held on die-back on citrus, stem bleeding disease on coconut, hairy caterpillar on groundnut, borers on sugarcane, thrips on chilly, aphis on tobacco, mil-dew on grape vine, leaf spot on turmeric, smut on cholam and many other diseases and insect pests.

(9) Agricultural Marketing.

39. The marketing section which was started last year continued to function. Government in their G.O. Ms. No. 2329, dated the 21st December 1936, sanctioned the post of an Assistant Marketing Officer to assist in the development work in the province. The section was mainly engaged in work connected with the survey of commodities which is preliminary to work of development in marketing. Unless survey work is done carefully and thoroughly any superstructure built on it would be unsound. The section dealt with the survey of eleven commodities and reports on these have been forwarded to Government. The total number so far surveyed since 1936 is 15. Apart from these, surveys of 14 other commodities have been started. Work consisted in the compilation of various data such as collection of railway statistics in regard to movements in important stations of all commodities under survey, estimates of areas, imports and exports, the trend of demand, prices, transport, marketing costs and various other items connected with the marketing and distribution of agricultural products.

In regard to grade standards, 1,108 samples in 1935–36 and 192 in 1936–37 were obtained and sent for analysis to various officers and concerns. Two sets of five grades each of samples of flue cured Virginian tobacco were collected for the newly formed tobacco association at Guntur and sent to the High Commissioner, London, through the Agricultural Marketing Adviser to the Government of India. A conference of representatives of growers, traders and manufacturers as well as of Provincial and Central marketing staff was held at Guntur during the year to decide on the grades that should be made of flue cured and sun dried Virginian tobacco and also of sun cured country tobacco.

The Provincial Marketing Board held three meetings during the year. As a result of the efforts of this Board it was possible to get the South Indian Railway to reduce the minimum load chargeable on a wagon load of plantains from 240 to 160 maunds and to provide luggage vans for transport. In order to prevent dry cows fit for breeding purposes from being sent to slaughter-houses in the cities—a practice which to-day is so common among city milkmen in different parts of India—the Madras and Southern Mahratta Railway was approached by the Board to reduce the rates for transport of cows from and to Madras to facilitate dry cows being sent to grazing areas to enable them to remain there till the time of calving. As a result, a 50 per cent reduction in railway freight was made from February 1937 for stations from Madras to Tenali. Again, it was found that wet hides and skins get damaged and stained when transported in iron wagons. The Board was able to persuade railways to arrange for quick transport of raw hides and skins.

With a view to stimulate and co-ordinate the work of various loan and sale societies in the Presidency and to find a sale for

their surplus produce at Madras or elsewhere, a Provincial Marketing Society was formed and the Provincial Marketing Officer was appointed as a member of the Board of management.

In regard to development work, reference has already been made to the conference held at Guntur to fix grade standards for cigarette tobacco suitable for export trade. Though the feeling among local merchants was to trade in grades hitherto adopted in London some merchants have sent to London a trial consignment of 250 bales of tobacco according to the standards fixed by the Association. Two Fruit Growers' Associations at Kodur and Vizianagaram have been registered as co-operative marketing organizations and received help from the provincial marketing staff. These associations, it is hoped, will start grading and marketing of citrus and mango fruits in the coming season. Arrangements are being made with the marketing staff in other provinces in Northern India to obtain direct sales for mangoes from Vizianagaram with a view to prevent intervention of local up-country commission agents. Similarly, attempts are being made to get the Northern Indian markets into touch with producers of plantains in the circars. Four wagon loads of oranges sent by the Fruit Growers' Association, Nagpur, were disposed of in Madras during the last season.

The section was also concerned in the collection of weekly market rates of about 35 commodities throughout the Presidency. Government recently ordered that the Director of Industries should publish weekly in local papers the wholesale prices of the main agricultural commodities ruling in different market centres.

Work through other agencies.

(1) Co-operation.

40. The co-operative loan and sale society at Anakapalle sold jaggery worth Rs. 1,11,500 and also 3,335 maunds of onion, 127 bags of paddy and 19 bags of groundnut. The Bimlipatam society disposed of 5,000 bags of groundnut and the cane growers' society at Bobbili raised short crops of Co. 213 and other sugarcane varieties and distributed 62 sugarcane mills. A groundnut warehouse at Villupuram, a sale society at Conjeeveram, and a co-operative marketing society in Sriperumpudur—all in the IV circle were started. Ten co-operative societies in the V circle acted as agents to ryots for the supply of their requirements in seed, manure, etc. Special mention may be made of the work done by the societies at Lalgudi, Kadiramangalam and Nidamangalam, which distributed large quantities of paddy, green manure seed and other manures. The society at Madura distributed over 10,000 lb. of cambodia and karunganni seed. The Tiruppur Co-operative Trading Society continued its work in seed multiplication of Co. 2 cambodia. Other societies which co-operated in agricultural development were those at Rasipuram and Idigarai in the VIII circle which concerned themselves with the improvement of cotton. A number of societies maintained breeding bulls.

(2) Agricultural Associations.

Three associations were formed in the Rajahmundry division of the I circle for general agricultural improvement and one for supply of milk to Rajahmundry. The Tanjore Delta Mirasidars' Association continues to issue its journal. The annual agricultural exhibition at Srirangam was held as usual by the Trichinopoly District Agricultural and Industrial Association. The Agricultural Improvement Society at Melur in the VI circle maintained more than 100 acres under cotton seed farms. The Agricultural Association at Palghat organized an agricultural exhibition and financed its members for the purchase of green manure seed.

The District Economic Councils started during the year helped to bring the existence of agricultural department to the notice of ryots although no grant has been earmarked for work directly connected with this department.

VI.—Legislation.

41. *Cotton Ginning and Pressing Factories Act.*—Eight new ginning factories were erected during the year, making a total of 625 at the end of the year. Four prosecutions were launched for infringement of the provisions of the Act and the occupiers of the four factories were convicted and fined. In the previous year there was only one prosecution. In order to prevent the mixing and watering of cotton to which reference was made in last year's report, a draft amending the Bill was circulated among the members of the Provincial Cotton Committee for opinion. It is proposed to consider this subject at a meeting of this committee before long.

42. *Cotton Transport Act*—(i) *Single licences by rail.*—Twenty-one licences were issued for import of waste cotton by rail into the two protected areas—northerns and westerns, and southerns. In addition, two licences were issued for import of ginned cotton into the northerns and westerns area. The total number of single licences issued during the year was thus 23 as against 48 in the previous year.

(ii) *Annual licences.*—Twenty general licences with 324 certified copies for import of ginned cotton by rail were issued to the cotton mills in the 'southerns' protected area, during the cotton year 1936–37 (1st February 1936 to 31st January 1937), as against 15 licences with 247 certified copies issued in the previous year. Two hundred and sixty-two certified copies of these were used as against 164 in the year previous, the rest being returned by the mills as unused. In addition, 20 general licences and 180 certified copies were issued to the mills, from 1st February 1937 to 31st March 1937.

(iii) *Licences by sea.*—Sixty licences were issued during the year for the import by sea of 68,976 bales of ginned cotton into Tuticorin port as against 50 licences for 50,535 bales issued in the previous year.

43. *Cotton Control Act.*—The enforcement of this Act prohibiting the cultivation and mixing of *pulichai* (*g. neglectum*) cotton was continued during the year in the VI circle. The Act worked satisfactorily during the year. Only stray cases of cultivation of this cotton were noticed.

44. *Cotton Markets Act.*—The provisions of the Madras Commercial Crops Markets Act (Act XX of 1933) in respect of cotton were continued to be enforced in the Tiruppur Municipality. The Tiruppur Cotton Market Committee, though constituted in the previous year actually began to function only after the 1936 cotton season. Nine meetings of the committee were held during the year. Besides 86 licences issued by Government under section 4 (i) of the Madras Commercial Crops Markets Act (1933), the committee licenced 113 buyers and sellers, 13 buyers, 5 sellers, 27 brokers and 72 weighmen during the year. Unauthorized allowances were thus prohibited whereby growers are benefited to the extent of 6 annas per 260 lb. of kapas. At the instance of the committee, the pressing charges at Tiruppur were reduced from Rs. 9 to Rs. 5 per candy of 784 lb. lint. The committee also supplied cotton market intelligence regularly. There was no occasion to refer disputes to the disputes sub-committee constituted during the year.

The Holmes Cotton Market yard at Tiruppur taken on a 3-year lease from the municipality in September 1936 was not made use of for cotton business as there are no godown facilities. Steps have since been taken by the committee to purchase this market outright and as soon as this is settled, it would be possible for the committee to provide such facilities as godowns, accommodation for men, cattle, carts, etc. This want detracted the growers from freely resorting to the committee's yard for business, although they were otherwise benefited by the market intelligence, controlled weighment and regulated trade allowances.

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

(i) *Cotton.*—The enforcement was in respect of two insect pests, stem-weevil (*pempheres affinis*) and pink boll-worm (*gelechia gossypiella*) attacking Cambodia and *pachanadan* cottons in Salem, Trichinopoly, Madura (except 10 villages which are interspersed in the Ramnad district) and Coimbatore district. There was delay in certain places in the eradication of the cotton plants before 1st September 1936, the prescribed date. The worst offender was Kulittalai taluk of the Trichinopoly district where there were 3,108 acres uneradicated on the due date. The plants were, however, completely removed by the 29th September 1936. This was followed by Trichinopoly taluk with 675 acres and Periyakulam taluk of the Madura district with 569 acres. As a result of the joint inspection by the Deputy Director of Agriculture, V Circle, the Cotton Specialist and the Government Entomologist of the

area in the Pudukottah State and the advice rendered to the officials in it at the desire of the Darbar, it is understood that the latter have agreed to bring a similar Act into force in the current year (1937–38). It is hoped that in future this will have the effect of reducing the uneradicated area in the villages of the Kulittalai taluk bordering the Pudukottah State. As a special case, in Periyakulam and Nilakkottai taluks of the Madura district, the last date of pulling out the plants was extended by a month from the 1st September 1936. Progress of eradication in the Salem and Coimbatore districts was generally satisfactory. In the special tract of Anamalai in the Coimbatore district, extension of time for pulling out the plants till 22nd October 1936 was granted by the Collector and the eradication was complete within the extended period. Observations and collection of data in respect of this tract mentioned in last year's report were continued. The *kar* crop was fair both in yield and quality and was best in Kottur. The *paruvam* yields were below normal except in the western zone, due to insufficient rainfall. Cotton sowing in May was a failure.

(ii) *Groundnut.*—The Act against the hairy caterpillar pest (*amsacta albistriga*) on groundnut was in force in the whole of the North Arcot district and a major portion of South Arcot district and three firkas of the Udaiyarpalaiyam taluk in the Trichinopoly district. The provisions of the Act were brought into force for the first time during the year in portions of the Tekkali taluk of the Vizagapatam district. The working of the Act was satisfactory in all places. The ryots are now gradually realizing the benefits of preventive methods in combating the pest.

(iii) *Palmyra and coconut.*—The Act was continued to be enforced in the three taluks of Palghat, Ponnani and Walluvanad of the Malabar district to check the disease of bud-rot on palmyra and coconut. In all, 3,847 diseased trees were cut during the year. As there are some more diseased trees as well as fresh attacks, the Act will continue to be in force for another year.

(iv) *Water hyacinth.*—The Act was in operation in the whole of Tanjore and Chingleput districts and in parts of Trichinopoly, South Arcot and Malabar districts.

VII.—Publications.

46. The undermentioned leaflets and bulletins were published during the year 1936–37 :—

Subject.	Languages in which published.	Price.
Leaflet series—		
(1) Cattle breeding	Tamil, Telugu, Kanarese and Malayalam (English edition published in 1935–36).	Free.
(2) Descriptive notes on improved strains of paddy evolved at the Agricultural Research Station, Maruteru.	Telugu (English edition published in 1935–36).	Do.

Subject.	Languages in which published.	Price.
Leaflet series—*cont.*		
(3) Breeding bulls and their management.	Tamil, Telugu, Kanarese and Malayalam (English edition published in 1935–36).	Free.
(4) The leaf curl disease of chillies.	English and Telugu (Tamil, Kanarese and Malayalam under print).	Do.
(5) The preparation of infant and invalid foods in the home from cholam.	English	Do.
(6) Conditions to be fulfilled for the grant of premium for breeding bulls.	English (vernacular editions under print).	Do.
(7) No water rate of fasaljasti for certain crops; concession made by Government to ryots in aid of cultivation.	Tamil, Telugu, Kanarese and Malayalam (English edition published in 1935–36).	Do.
(8) Red hairy caterpillar pest.	Telugu and Tamil	Do.
(9) A short note on potato cultivation.	English (vernacular editions under print).	Do.
(10) Bud rot on coconut palms in Malabar district.	English and Malayalam ..	Do.
(11) Some advantages of poultry keeping.	English, Tamil, Telugu, Kanarese and Malayalam.	Do.
(12) Natural incubation of poultry.	English, Telugu, Kanarese, Malayalam (Tamil under print).	Do.
(13) Brooding and rearing of chicks.	English, Telugu, Malayalam (Tamil and Kanarese under print).	Do.
(14) Housing of poultry ..	English, Tamil, Telugu, Kanarese (Malayalam under print).	Do.
(15) Mahali disease	English and Kanarese	Do.
(16) Rations for milch cows, dry cows, calves, etc.	Telugu	Do.
		RS. A. P.
Bulletins—		
Some practical hints on bee-keeping (reprinted).	English (Tamil under print) ..	1 0 0
Livestock of Southern India by R. W. Littlewood.	....	3 6 0
Pamphlet series—		
Coconut cultivation	English, Tamil, Kanarese and Malayalam (Telugu under (print).	Free.
Use of manures in the Madras Presidency.	English, Tamil, Kanarese and Malayalam (Telugu under print).	Do.
Note series—		
A note on Nilgiris agriculture ..	English and Tamil	Do.

47. The number of copies of the Villagers' calendar printed i each language during 1936–37 was as follows :—

English (1936 edition) ..	..	..	4,750
Tamil (1936–37 edition)	..	..	19,300
Telugu do.	..	..	26,950
Kanarese do.	..	..	3,850
Malayalam do.	..	..	6,900
	Total ..		61,750

VIII.—Statistics.

48. *Weekly cotton mill and press returns.* There were 42 spinning mills during the year all of which continued to send their returns of cotton received in their mills every week. Returns from the cotton presses and the Collectors of Customs were also received every week.

49. *Enquiry into the cost of production of crops.*—This enquiry, financed by the Imperial Council of Agricultural Research since the 1st April 1933, in the districts of Bellary, Vizagapatam and Coimbatore, was concluded during the year. The final reports and data have since been forwarded to Government for transmission to the Imperial Council of Agricultural Research.

50. *Crop cutting experiments.*—After a lapse of several years, crop cutting experiments on four main food crops, namely, paddy, cholam, cumbu and ragi were conducted during the year in all the districts where they form the major crops by the Revenue Inspectors and Agricultural Demonstrators. Crop cutting experiments on sugarcane were also conducted in some districts during the year. The results are not yet to hand.

IX.—Expenditure.

51. The receipts and expenditure for the year 1936–37 and the corresponding figures for the previous year are given below :—

	1936–37.	1935–36.
	Rs.	Rs.
Expenditure	19,54,180	18,57,827
Receipts	1,88,792	1,91,168
Net expenditure ..	17,65,388	16,66,659

The increase in expenditure in 1936–37 is mainly due to the appointment of more Agricultural Demonstrators. The decrease in receipts is due generally to the reduction in area under cotton seed farms owing to bad season.

X.—General.

52. This is the last report I would submit to Government and I take this opportunity to record my great appreciation of work done and assistance rendered by officers of all grades of the department. In spite of increase of work in every direction, the staff has striven to keep up-to-date without sacrificing efficiency. With a set of officers who are dependable and who would always co-operate, none could wish for a better team of workers.

XI.—Programme of Work for 1937–38.

(1) *Botany.*—(*a*) Floristic survey of South Kanara, Coorg and part of Coimbatore district; (*b*) Survey and study of indigenous fodder grasses and bananas.

(2) *Chemistry.*—Analytical and advisory work will be continued as before and work on soils of the Nanjanad farm will be taken up in addition.

Soil surveys.—Field work of Gundlakamma Project soil survey and work on the effect of irrigation on black soils at Siruguppa will be taken up.

Soil research.—A study of the method of estimation of the electrical conductivity in South Indian soils, standardization of the electrical conductivity method for the rapid determination of the salt content of waters and soils, factors affecting the pH of soils, study of the factors, e.g., base status, degree of alkalization, salt content, organic matter content and the physical structure likely to affect the reaction of the soil and methods of controlling it, study of the origin and the geo-chemical characteristics of the black soils of the Ceded districts, and the preliminary study of the problem of amelioration of alkaline soils.

Plant nutrition—Permanent manurial experiments—Old and new.—Studies on the electrical conductivity, base exchange and physical composition as influenced by long standing uniformity in manurial treatment, influence of manuring on the mineral composition and keeping quality of plantains, effect of manuring on the non-sugar organic matter of sugarcane, the stimulating effect of organic matter on crop quality, effect of organic manure on plant growth, to study the action of manures on plant metabolism, effect of manuring on the synthesis of proteins of herbage.

Animal nutrition.—Protein requirements for work, the nitrogen partition of herbivore on different protein diets and digestibility co-efficients of various combinations of fodder and concentrate; use of molasses as cattle food.

Microbiology.—Studies on nitrogen fixation in soils, *Fusarium Moliniforme*, groundnut nodule organism, the keeping quality of milk in the home under South Indian conditions, i.e., after boiling.

Sugarcane and jaggery.—Studies on the arrowing of sugarcane, methods for the assessment of the maturity of sugarcane, study of the non-sugar organic matter in cane juice, preparation of active carbon, investigations into the making of refined jaggery, and microscopic, spectroscopic and bio-chemical study of active carbons.

Miscellaneous.—Research on composition and vitamin content of fruits, bio-chemical values of brown and white ragi, and differences in nutritive value of red-gram grown on hills and plains.

Programmes approved by the Imperial Council of Agricultural Research for dry farming, animal nutrition and malt schemes will be carried out.

(3) *Crops*—(*a*) *Millets.*—Continuation of the survey of the rainfed cholams, studies in the inheritance of characters in sorghum, varietal studies and selection for yield, improvement of the fodder

value of cholam straw, comparative trial of cholam, cumbu, ragi and korra, the evolution of a short duration economic strain of ragi, study of pollination mechanism and hybridization technique and inheritance of studies.

(*b*) *Paddy.*—Economic work by selection and hybridization, cultural, manurial, seasonal and irrigation experiments, fundamental studies in cytology, physiology and micro-chemical study of the nutritive value of paddy.

(*c*) *Cotton.*—Studies of the progenies of direct and back crosses of South African, Egyptian, Russian, and Trinidad cottons with Co. 2 cotton. Determination of the rate of contamination in Co. 2 and study of inheritance of characters.

Indian Central Cotton Committee Schemes.—Madras Herbaceum Scheme, Madras Pempheres and Physiological Scheme, Madras Nadam Scheme and Mungari Cotton Scheme will be continued.

(*d*) *Oil seeds.*—Comparative yield trials of groundnut, castor and gingelly, selections and isolation of pure lines, seed multiplication, study of the progeny of crosses for economic characters and inheritance, hybridization for producing new desirable types; correlation of plant characters with yield, study of tropism of the gynophore and the depth of penetration in the soil in the different varieties, standardization of the method of oil analysis, determination of oil content in types, study of the varietal resistance to rhizoctonia wilt disease, analysis of oil and acid value, checking the classification and root studies of varieties, manurial experiments, shelling percentages and seed weights of different varieties and selections. Studies on coconut will progress on the following lines: Manurial experiments, the effect of different types of trenches on the shedding of leaves and yield study of the progenies of economic crosses, study of the progeny F_{1s} and "selfed" parents. Investigation into the causes of button shedding, oil and copra content of nuts from different types of palms.

(*e*) *Pulses.*—Varietal and inheritance studies in lablab and cowpea, trial of red-gram selections, testing promising cultures and study of inheritance of seed coat colour. Study of bengal-gram crosses and inheritance and multiplication of the two strains evolved.

(*f*) *Fruits.*—Experiments in propagation—budding, grafting and root stock trials, varietal trial of citrus and mango, experimental grafting of mangosteen on to various other species, manurial experiments on plums, seed selection of straw berries, growing of selected and edible varieties of lupins, propagation of fruit plants and distribution of grafts and seedlings.

(*g*) *Medicinal plants.*—The cultivation of medicinal plants from an economic point of view will receive further attention.

(*h*) *Sugarcane.*—Research on increase in yield by varietal, manurial and cultural methods, studies on the reduction of cost of production, irrigation trials, improvements in the colour and keeping quality of jaggery, trial of planting sugarcane in double-crop lands without any irrigation during summer, determination of relative suitability of various thick and thin canes for local conditions.

(4) *Entomology.*—Study of pests on paddy, coconut, cholam, cotton, sugarcane, fruit trees, vegetables and stored products, systematic work on parasites of crop pests, trials of patent and indigenous insecticides, experiments on the chemotropic response of insects, research on various aspects of bee-keeping and study of eri silkworms.

(5) *Mycology.*—Isolation and identification of soil fungi, collection of the species of Helminthosporium of cereals and a study of their morphology and pathology, study of areca mahali, field experiments for control of black shank, comparative and physiological studies of red-gram wilt, study of Macrophomina wilt of groundnuts, gingelly, black-gram, etc., diseases of bananas and study of their parasitism, study of paddy piricularia, Nigrospora on paddy and paddy foot rot, collection and preservation of specimens of virus diseases in South India, continuation of studies in sugarcane mosaic and cholam stripe disease, study of red-gram mosaic, rust of wheat, and laboratory tests of the wetting, spreading and adhesive properties of spreaders and adhesives used with fungicides.

(6) *Implements.*—Further tests of water lifts and seed drills, experimentation with a view to the development of an improved design of guntaka for groundnut lifting, trials of simple and efficient designs of winnowing machines which can be produced at a low cost, trials of paddy husking and oil milling machines, continuation of cane mill trials and wind mill records, development of light rotary hoe for bullock draught and improved bund forming implement, trials of new ploughs, design of single furrow reversible disc plough of small capacity for draught of a pair of cattle, development of cotton seed defibrating machine, experiments with oven drying of grain, further improvements in the design of rubber-tyred carts, tests of country made ropes, and further trials of cotton seed crushers.

(7) *Irrigation.*—The irrigation experiments that are in progress at Samalkota, Nandyal and Palur for finding out the quantity of water required for paddy, sugarcane and plantain will be continued.

(8) *Livestock.*—Improvement of cattle by building up a pure herd of Kangayam cattle to improve the milk yield without impairing the draught qualities of the bulls; building up a herd of good milking cows of the Sindhi breed and a herd of good working cattle of the Hallikar breed by selection and the improvement of Ongole cattle and buffaloes at Guntur till the new stations are opened.

Sheep breeding.—Evolving a pure white strain of Bellary sheep.

Poultry.—Work on poultry will be continued by maintaining improved breeds in different Agricultural Research Stations and supplying eggs and birds to public.

(9) *Marketing.*—Marketing survey of new commodities like pepper, cashew, areca, etc., development work on rice, groundnut, tobacco, fruits, milk, cattle, eggs.

AGRICULTURAL RESEARCH STATIONS.

Anakapalle—Sugarcane.—Meteorological study of correlation between temperature and growth of cane; study of germination, growth, root system and external characters; cultural, varietal and manurial trials; study of fibre content, sugar recovery, keeping quality of jaggery and deterioration of harvested cane and economic study of sugarcane cultivation.

Paddy.—Multiplication of improved strains, manurial and varietal trials and comparative trials of different selections.

Ragi.—Multiplication of improved strains, comparative trials of new strains.

Other crops.—Trials of groundnut, cotton, cholam, cumbu, tenai, chillies, tobacco and fibre crops.

Poultry, apiculture and fruit culture.

Samalkota—Sugarcane.—Comparative study of different varieties, manurial experiments to find out the nitrogen requirements.

Paddy.—Selection work in the main and second-crop varieties, trials of varieties in the intermediate season, and study of manurial requirements of second crop.

Plantain.—Study of varieties under "Seethacattu" and "Tholakari" plantings, study of manurial requirements of Karpura Chakkarakali and White Chakkarakali, hybridization work and preparation of plantain figs.

Other crops.—Selection work on pulses and chillies, trial of soya beans, fruit plants and sunnhemp.

Poultry and apiculture.

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

Other crops.—Trial of bengal-gram, gingelly, coriander, soya beans, teosinte, vegetables, medicinal plants and fruit plants.

Bee-keeping, poultry and fish culture.

Buchireddipalayam Rice Research Station—Paddy.—Survey of different local varieties and introduced varieties in three seasons, varietal, manurial and cultural trials.

Kodur Fruit Research Station.—Collection of material for varietal trials of strains of mango and other taxonomical studies for classification.

Gudiyattam—Sugarcane.—Study of several varieties grown under restricted manure and irrigation, ratoon *versus* plant canes, determination of suitable season for planting, intensive and poorly fertilized short crop, ripening trials, wrapping and propping trial, and method of sampling canes in experimental plots.

Paddy.—Manurial trials.

Other crops.—Multiplication and distribution of ragi, cholam, groundnut, gingelly and cotton.

Hagari—Cotton.—Composition 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.

Miscellaneous crops.—Trial of sugarcane, ragi, soya bean, paddy and vegetables. Research on soil physics in relation to dry farming problems of black soil.

Apiculture and cattle rearing.

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

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

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

Palur—Sugarcane.—Varietal, cultural and manurial trials, trial of drought-resistant varieties, study of duty of water, planting cane month-war to find out the best planting season, spacing experiments, effect of thrashing on yield and quality of canes and jaggery, multiplication of setts by short crop method.

Paddy.—Seed multiplication of important strains, selection work on chinna samba, seevan samba and vadan samba, varietal trials of short duration varieties, study of water requirements of paddy under wet land conditions, bonemeal optimum dose experiment.

Other crops.—Growing of sweet-flag, vegetables, strip trials of tenai, cumbu and ragi.

General.—Composting as per Indore method, cholam ensilage, citrus manuring, apiary, preparation of activated carbon and manufacture of cream jaggery; poultry.

Aduturai Paddy.—Multiplication of bulk seeds of 13 strains, district trials of kona kuruvai and muthu samba, comparative and manurial trials, effect of bonemeal doses, molasses as manure for paddy.

Other crops.—Trial of green manure crops, plantains, sugarcane, vegetables, bananas, turmeric, cotton, pineapples and fruit plants.

Poultry, bee-keeping, pisciculture and dairy.

Pattukottai—Paddy.—Trial of Coimbatore and Aduturai strains and manurial trials.

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

Poultry, maintenance of breeding bulls, and apiary.

Ambasamudram—Paddy.—Survey of paddy areas, study of local and introduced varieties, and soil heterogenity, isolation of promising cultures, intervarietal trials and introduction of suitable green manure crops.

Koilpatti—Cotton.—Work on evolution of better strains, selection work with hybridized materials, and cultural experiments.

Cholam.—Trial of irrigated varieties, selection work on unirrigated varieties.

Other crops.—Trial of cumbu, ragi, tenai, blackgram, greengram, coriander, groundnut, linseed, tomatoes, tobacco, sugarcane, chillies.

Poultry and cattle rearing.

Taliparamba.—Varietal trials of paddy, sugarcane, plantains, ginger, chilly, ragi and arecanut, study of pineapple, mango, cashew, sapota and other fruit plants. Study of manurial requirements of pepper.

Bee-keeping, poultry breeding and maintenance of a small buffalo herd.

Nanjanad—Potato.—Breeding and selection. Comparative trial of promising varieties. Manurial, varietal and cultural experiments.

Other crops.—Trial of lupins and Pusa types of barley, oats, wheat and bengalgram.

Goat breeding.

Trial Plots.

First circle.—Trial of new strains of paddy, sugarcane J. 247, Co. 213, POJ. 2878, Co. 313, Co. 281, Co. 419 and Co. 421; improved strains of ragi, groundnut A.H. 25 and 45 T_6 jonna.

Second circle.—Trial of paddy strains Vankisannam, Atragada, G.E.B., MTU., Garikasannavari, AEB., Adt. 11, Molakolukulu, Iswara Kora, Co. 3 hybrids Nos. 10905 and 10783.

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

Fourth circle.—Trial of periamanjal cholam, gingelly, groundnut A.H. 45, ragi EC. 1507, sugarcane Co. 419 and Co. 421.

Fifth circle.—Trial of groundnut, cotton, tobacco, green manure seeds, cotton strain Nos. 920 and 1267, periamanjal cholam *versus* local irungu, kuruvai mutant strain No. 6110, konakuruvai and sinna samba strain No. 693. EC. 593 ragi, Bellary and Punjab cumbu and cholam, bengal and redgram; trial of inoculation of legume organism in irrigated groundnut.

Sixth circle.—Trials of rainfed and irrigated strain of cholam, ragi EC. 593 and EC. 24; Punjab cumbu and tenai. Trial of new strain of cotton, A.H. 25 and bunch groundnuts.

Seventh circle.—Trial of strains of paddy and new varieties of sugarcane.

Eighth circle.—Trial of improved Pusa strains of wheat and barley, paddy A.S. 1575 and 809 cholam, E.C. 593 ragi, cotton, groundnut, sugarcane, potatoes, linseed, bengalgram, cholam, cumbu, tenai and redgram.

Demonstration.

(1) *Crops.*—Strains of paddy, ragi, cholam, Punjab cumbu, E.C. 593 ragi, cotton, sugarcane, bengalgram, tobacco, groundnut, potatoes, Bellary onion, lucerne, coconuts, tapioca, economic planting, intercultivation of cotton, spacing experiments, advocating reduced seed rate, advice on the importance of roguing and clean cultivation—maintaining cost of cultivation in each crop. Extension of areas under various crops.

(2) *Implements.*—Advocating the use of improved ploughs, guntakas, mhote wheels, Persian wheels and sprayers, use of better cane mills, demonstration of cream jaggery manufacture, advocating the use of water lifts, pumps and engines.

(3) *Manures.*—Conservation of farm yard manure on improved lines, composting of organic waste material; extension of green manuring, Indore compost, poudrette preparation, preservation of cattle manure, dry earth sheds, application of phosphatic manures, oil-cakes, fish manure and bonemeal, use of night-soil and municipal rubbish.

(4) *Seed supply.*—Introduction and extension of improved varieties of various crops suitable to each locality.

(5) *Livestock.*—Increasing the number of breeding bulls; supplying milk breeds in suitable localities, propaganda on the proper feeding and care of cattle; encouraging ryots to grow fodder crops; distribution of good breeds of birds; and extension of bee-keeping.

(6) *Jaggery manufacture.*—Preparation of activated carbon, manufacture of cream jaggery and white sugar with centrifugal machines.

(7) *Insect pests and diseases.*—Demonstration of remedial measures against betel vine wilt, tobacco rot, yam disease, coconut stem-bleeding disease, citrus disease, campaign against hairy caterpillar pest.

(8) Concentrated demonstration work in villages.

(9) Exhibitions on festive occasions, tour of motor exhibition van, lantern and open air lectures.

(10) Firka agricultural associations.

I have the honour to be,

Sir,

Your most obedient servant,

D. ANANDA RAO,
Director of Agriculture

GLOSSARY.

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

Mangosteen	*Garcinia mangostana.*
Oats	*Avena sativa.*
Onions	*Allium sativum.*
Oranges	*Citrus aurantium.*
Paddy	*Oryza sativa.*
Palmyra	*Borassus flabellifer.*
Pears	*Pyrus communis.*
Pepper	*Piper nigrum.*
Pillipesara	*Phaseolus trilobus, ait.*
Pineapple	*Ananas sativa.*
Plantain	*Musa sapientum.*
Plums	*Prunus salicina.*
Potato	*Solanum tuberosum.*
Radish	*Raphanus sativas, linn.*
Ragi	*Eleusine coracana.*
Redgram	*Cajanus indicus.*
Rose	*Rosa, linn.*
Safflower	*Carthamus tinctorius.*
Salt bush	*Atriplex nummularium.*
Samai	*Panicum miliare.*
Sapota	*Achras sapota.*
Soya beans	*Glycine soja.*
Strawberries	*Fragaria vesca.*
Sugarcane	*Saccharum officinarum.*
Sunnhemp	*Crotolaria juncea.*
Sweet flag	*Acorus calamus.*
Sweet potato	*Ipomœa batatas.*
Tapioca	*Manihout utilissima.*
Tenai	*Setaria italica.*
Teosinte	*Euchlœna, mxiœna, schrad.*
Tobacco	*Nicotiana tabacum.*
Tomato	*Cyphomandra betacea.*
Tung oil plant	*Aleurities fordii.*
Turmeric	*Curcuma longa.*
Variga	*Panicum miliaceum.*
Water hyacinth	*Eichhornia crassipes, solms.*
Wheat	*Triticum spp.*

Government of Madras

DEVELOPMENT DEPARTMENT

G.O. No. 2391, 25th October 1937

Agriculture—Administration Report—1936-37—Recorded with remarks.

READ—the following paper :—

From the Director of Agriculture, dated 26th July 1937, Roc. No. D. 68-Pdl./37.

Order—No. 2391, Development, dated 25th October 1937.

Recorded.

2. The Government have read with interest the account given by the Director of Agriculture of the progress and achievements of his department during the year 1936-37. They trust that the "Popular Account" of the department's activities during the past thirteen years which the Director hopes to release for publication shortly will be found interesting by the public at large for whose benefit and use it is intended.

3. During the year under review, agricultural education continued to be imparted on the usual lines. The degree course at the Agricultural College judged from the increase in the number of applications for admission appeared to hold out greater attractions to young men than in the previous two years and, as if confirming the intelligent anticipations of the applicants, the year found almost all eligible and suitable young agricultural graduates who were until then remaining unemployed, absorbed in the department in the large number of new appointments sanctioned in the course of the year. In fact the supply from the Telugu districts has been found to fall far short of actual requirements. There can be no doubt that with the equal treatment they now receive with Arts Graduates in the matter of recruitment to the Revenue Department and even preferential treatment in the matter of recruitment to certain appointments in the co-operative department and with the increasing demand for qualified men for purposes of rural reconstruction work, agricultural graduates will find larger avenues for employment than many others in the future. The

College continued to provide short courses in practical agriculture and thus afforded facilities for a good number of young men to acquire a working knowledge in several branches, such as, farm management, care of animals, dairying, malt-making, jaggery-making, bee-keeping and horticulture. In order to provide similar facilities in other linguistic areas, similar short courses were started at Nandyal and Taliparamba during the year. They do not appear to have been much of a success but are, all the same, being continued during the current year in order to give them a fair trial.

The Farm Labourers' Schools at Anakapalle, Palur and Coimbatore are an attempt to impart elementary general education and some agricultural education to the labourers employed at the Government Agricultural Stations at these places and to their children so that those already in employ might prove more useful and better trained labour might be made available for recruitment hereafter. The experiment appears to be bearing fruit inasmuch as it has been found possible to recruit a few agricultural demonstration maistris from among this class of people. The District Board Agricultural Middle School at Usilampatti originally started for imparting agricultural education to the boys of land-owning Kallar families has been found to have failed in its purpose and the district board proposes to close it down shortly. A novel experiment tried during the year was an attempt at finding a solution of the problem of unemployment among the educated young men belonging to land-owning agricultural families. With a view to giving them practical training in agriculture and thereby affording them an opportunity to take an intelligent interest in their own lands arrangements were made to train 150 young men who had passed at least the Secondary School-Leaving Certificate Examination for a period of four months during the cultivation season at the several Agricultural stations in the Presidency, paying them a stipend of Rs. 15 during the period of training. The experiment was not altogether a success. There were only 128 suitable applicants. Of these, only 73 completed the course; the remaining 55 did not join at all or left the course in the middle. The scheme is being given another trial but on a less ambitious scale during the current cultivation season.

4. The visit of Sir John Russell, D.Sc., F.R.S., Director, Rothamsted Experimental Station, to the Agricultural Research Institute, Coimbatore, in the course of his tours during the year throughout India to examine the research schemes carried on under the auspices of the Imperial Council of Agricultural Research was an occasion for the several sections of the Institute to take stock of what each had been able to do during the past fifteen years. The reports drawn up by the heads of sections were made available to Sir John Russell before he visited the Institute. The Government will examine the desirability of publishing these reports after

they have had an opportunity to see whether Sir John Russell has in his report made any proposals or suggestions in respect of the work of these sections.

5. During the year under review, the Botany section of the Research Institute continued its usual work of identification of botanical specimens and also the plantain survey in the districts of Cuddapah, Kurnool and Anantapur.

6. The Chemistry section, the largest in the institute, did good work. As many as 2,155 samples of human food, animal food and fodder, water for irrigation purposes and manures and soils were analysed and advice given. Soil surveys were carried out of the Cauvery-Mettur Project area and the Kattalai High Level Channel area in order to find out deficiencies and sufficiencies of plant food in them. Gundlakamma Project was in progress. The survey of the Cauvery-Mettur Project area showed that the soils are poor and require judicious manuring and improvement in drainage. The chowdu problem that has arisen in some of the lands under the Kattalai High Level Channel is receiving the attention of the section. The activated sludge plant has successfully demonstrated how night soil could be converted into a highly efficient manure, and that the effluent has an appreciable effect on the yield of paddy, if let in after the seedlings have established themselves. It is hoped that municipalities which can find the money required would make themselves acquainted with the process and themselves set up similar plant to deal with the night soil of their towns, much to the benefit of the landowners and to their own finances also. Two schemes of research financed by the Imperial Council of Agricultural Research are in progress in the section, namely, animal nutrition and malting of cholam.

7. In the paddy section, one of the three strains of *sendinayagam* of Tinnevelly which gave an increase of 17 per cent over the standard will shortly be released for distribution under the name of Co. 12. At Maruteru, strains Mtu. 9, Mtu. 10 and Mtu. 11 which are selections from *garikasannavari*, *sannakrishna katukalu* and *konamani*, respectively, and whose superiority over the standards varied from 18 to 30 per cent were released for distribution in the district. Six hundred selections and 189 cultures were under trial at Pattambi. At Aduturai, Vellaikar strain No. 798 gave an increased yield of 14 per cent over the standard and will be released under the name of Adt. 14. A mutant from Adt. 4 (6,119) tested for three years gave an average increase of 23·7 per cent over the standard and it is proposed to send it out into the district as Adt. 15 in this season. Studies in the inheritance of characters, hybrid vigour in rice, root studies and alkaline resistance were under way at Coimbatore. Interesting results have been obtained from cultural and manurial trials and irrigation experiments and these are recorded in paragraph 15 of the Director's report. There have been insistent demands for more and more agricultural stations. A sub-station has been sanctioned for Tinnevelly and another for

Nellore and these will be opened shortly. Proposals for opening stations in other districts have been held up for want of funds.

8. In the Millets section interesting experiments were in progress on sorghum, ragi, cumbu and korra. About 9,400 lb. of seed of sorghum strains and 1,500 lb. of seed of ragi were distributed in the districts.

9. The Herbaceum Scheme of the Indian Central Cotton Committee having failed in its object of evolving an improved strain from Uppam and Karunganni Cotton to replace the local varieties in the Salem and Tinnevelly tracts is now being continued with a view to securing a strain by hybridisation. Two hybrid strains have in fact been evolved of which one (4,714) is now under field trial. The Pempheres and Physiological Scheme is another scheme of the Committee which has for its object minimizing by breeding and physiological methods, bud, flower and boll shedding in Karunganni caused by untimely rains and devising control measures against the cotton stem-borer. Promising results have been achived in the isolation of strains in Karunganni resistant to the shedding of buds and bolls but the introduction of parasites on the weevil have not so far met with success. The Fodder Cholam Scheme was started in 1931 again under the aegis of the Indian Central Cotton Committee to study the effects of cholam as compared with those of cumbu on the succeeding crop of cotton in rotation in black cotton soils and to find out suitable remedial measures in order that cultivators may grow sufficient cholam fodder without suffering any loss in the yield of cotton. The scheme was closed down in June last. It has established, among other results, that the harmful effect of sorghum was due to the rise of sodium salts from the lower layers, that cotton sown thick was able to induce normal yields and that the application of molasses as a corrective to alkalinity showed better growth.

The Nadam Cotton Breeding Scheme, now in progress, aims at evolving a suitable type to replace the perennial variety of Nadam grown in Salem and Coimbatore districts which now serves as a breeding ground for the Cambodia pest. The Co. 2 seed distribution scheme worked by the Tiruppur Co-operative Trading Society with a grant from the Indian Central Cotton Committee was closed down in September 1937. It was in operation for a sufficiently long time and the Government hope that the ryots will now be able to provide themselves with a sufficient supply. Seeing that Co. 2 seed yields 15 per cent more which means an increased income of Rs. 15 per acre, no other inducement would seem necessary.

The extension of sugarcane cultivation has not been as rapid as one would have expected. A very large amount of work remains to be done for increasing the extent under improved varieties and for reducing the cost of cultivation. A number of trials under varietal, manurial, irrigation and ratooning experiments were in

progress at Anakapalle, Gudiyattam, Samalkot and Palur sugarcane stations. At Gudiyattam it was found that Co. 419 grown under normal conditions yielded best at 69 tons per acre as compared with 25 tons of J. 247 while at Anakapalle it yielded 55 tons and was found the best of all other varieties.

10. Research work on oil seeds consisted in the investigation of groundnut, castor, gingelly and coconut with the triple object of obtaining increased yield, improved variety and reduced cost of production. The two varieties of groundnut—the spreading variety and the bunch variety—are under comparative trials at Tindivanam. Sixty-five selections in the spreading variety are under final comparative trials and sixty under preliminary yield trials. Three hundred and eighty-five samples of groundnut collected from all over India were analysed for refraction and 101 for oil and free fatty acid content. In the majority of the Madras samples, the oil content was found to be 50 per cent. An intensive scheme of research on groundnut sanctioned by the Imperial Council of Agricultural Research was started in January 1937. Eight economic types of castor isolated from the presidency varieties were under trial, as also 27 selections isolated from a cross. On analysis the oil content of castor was found to vary from 35 to 61 per cent and of gingelly from Nayudupet was found to be the highest, viz., 52 per cent.

11. The work in the Entomological and Mycological sections was continued on the usual lines and an interesting line of investigation pursued was to introduce natural insect enemies into plants which attack the pest and keep it under control. Following a severe outbreak of *Mahali* disease on areca palm in South Kanara during the year, further studies of the disease were started with a view to devising preventive methods.

12. The Engineering section designed and tried several new types of agricultural implements. Several designs of bullock harness were made at the workshops, and two Indian made chaff cutters, a grain polishing machine and a Japanese paddy huller were under trial. Tests on an improved turmeric polisher were completed and the implement was popularized during the year in parts of the Coimbatore district.

13. The results of research at the Research Institute and the several agricultural stations before they can be recommended for adoption in general agricultural practice are first put to practical test in farms and select centres. Such tests were being made in 902 trial plots in ryots' own land during the year with successful results while there were as many as 7,554 demonstration plots again in ryots' own land to demonstrate the superiority of departmental methods. The main improvements suggested are a reduction in the seed rate, employment of light iron ploughs, use of improved guntakas and cheap methods of planting and manuring etc., especially in cultivating paddy where the fall in prices makes the growing of the crop unremunerative.

The following statement which shows the quantity of improved strains of some of the important seeds distributed by the department and the area under cultivation with these strains is an index of the work of the department in these lines :—

Crops.	Total quantity.	Total area under improved varieties.
Cotton	4,70,796 lbs.	615,415 acres.
Groundnut	22,793 ,,	1,613 ,,
Paddy	2,403 tons	1,395,043 ,,
Sugarcane	38,487,795 setts.	42,650 ,,
Potato	69,047 lbs.	12,068 (Nilgiris).

The figures show that there remains a good deal more to do by way of persuasion and propaganda. There is little information in the report as to the extent to which improved agricultural implements are being adopted. Sanction was accorded during the year for the opening of a large number of depots for stocking these implements for sale to the ryots. The Government trust that this would give an added stimulus to the popularization of these implements to a larger extent than in the past.

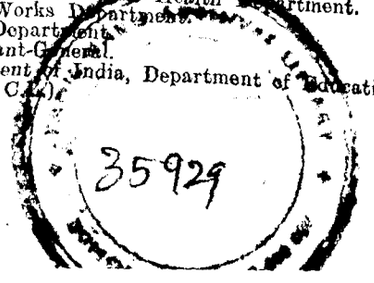
14. The Marketing section which is financed largely by the Imperial Council of Agricultural Research and partly from the provincial revenues has completed the survey of some of the important commodities such as rice, tobacco, wheat, linseed, eggs, potatoes, coffee, hides and skins, fruits such as apples, plums, grapes, pears, pine apples, peaches and plantains, groundnut, cattle (oxen and buffaloes) and milk. Valuable data have been collected and supplied to the Agricultural Marketing Officer of the Imperial Council of Agricultural Research who is the co-ordinating authority between the staffs of the several provinces. Survey reports as such will not be released for publication until after all provinces have finished the work on each commodity and the provincial reports are scrutinized and co-ordinated. The Director of Agriculture has been asked to place at the disposal of the public in the meantime the facts so far collected in the form of Press notes. The Government trust that these notes will be found both interesting and useful.

(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.
,, Government of India, Department of Education, Health and Lands (with C.L.).

Press.



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