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Report of subordinate
officers of the Department
of Agriculture, Madras.
for - 1935-36



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**REPORT OF SUBORDINATE OFFICERS OF THE
DEPARTMENT OF AGRICULTURE, MADRAS,
FOR 1935-36.**

(1)

ADMINISTRATION REPORT OF THE PRINCIPAL, AGRICULTURAL COLLEGE, COIMBATORE, FOR 1935-36.

I took charge as Principal of the College on the 22nd June 35, relieving M.R.Ry. Rao Bahadur D. Ananda Rao Garu and continued in charge throughout the year. I was appointed Chairman of the Board of Examiners and Examiner in Agriculture for 1935-36. In October 1935, I took the senior students on tour Bellary, Bangalore, Mysore, Hosur and Salem districts.

2. *Staff.*—M.R.Ry. M. U. Vellodi Avargal, Superintendent, Central Farm, took leave from the 6th September 1935 and I carried on his duties in addition to my own until M.R.Ry. S. Narayana Ayya Garu joined as Superintendent on the 2nd October 35. M.R.Ry. S. Narayana Ayya Garu was relieved on the 6th December 1935 by M.R.Ry. K. T. Bhandary who held the post until the 23rd December 1935. M.R.Ry. M. U. Vellodi Avargal, returned to duty on the 3rd January 1936 and continued as Superintendent until the end of the year. As in the previous year our officers held the post of Superintendent, Central Farm, during the year. M.R.Ry. P. S. Jivanna Rao Avargal, Lecturer in Botany, took leave on average pay for two months and sixteen days from the 8th October 1935 and was succeeded as Lecturer in Botany by M.R.Ry. S. N. Chandrasekhara Ayyar, Assistant Lecturer in Botany until 23rd December 1935. M.R.Ry. P. S. Jivanna Rao rejoined duty on the 3rd January 1936. M.R.Ry. C. Cherian Avargal, Lecturer in Zoology, was transferred as Licentiating Government Entomologist and his place was taken temporarily by M.R.Ry. P. N. Krishna Ayyar Avargal until M.R.Ry. J. A. Muliyl Avargal joined duty as Lecturer in Zoology on the 10th October 1935 on his return from leave out of India.

3. *The College.*—The College re-opened after the summer vacation on the 15th June 1935, but B.Sc. (Ag.) Class I was resumed only from the 2nd July 1935.

4. *Admission.*—One hundred and sixteen applications were received as compared with 91 in 1934. Ninety-six qualified candidates appeared for interview by the Selection Committee at Samalkota, Madras and Coimbatore and 44 were selected of whom 35 joined the College on the 2nd July 1935. Nine vacancies were

filled from the waiting list, the ultimate strength of the class being 44. Two students resigned during the year. Two failed students re-joined for part of the session. Forty-four students appeared for the First B.Sc. (Ag.) examination in April 1936.

The class as divided into linguistic areas and communities was as follows :—

Districts.			Communities.		
Tamils	..	23	Brahmans	..	24
Telugus	..	14	Non-Brahmans	..	7
Malayalams	..	7	Muhammadans	..	7
Indian states	..	Nil.	Christians	..	3
			Backward class	..	3

5. *Short courses in Agriculture.*—The following short courses were conducted during the year.

Course.	Time.	Duration.	Number of students.
1 Farm management	June to March	Nine months	12
2 Malt making	October	15 days	16
3 Insect pests and diseases	November	15 days	18
4 Jaggery making	February	25 days	26
5 Bee keeping	February	25 days	25

Students attending the Farm Management course were permitted to attend courses 2 to 5 also.

6. *Course in co-operation.*—This course, started in 1934, was carried on during the first and second terms of the session when 35 students attended during the first term and 17 students during the second term. As no students attended during the third term, the classes had to be closed. Unless B.Sc. (Ags.), are selected for appointment to the Co-operative Department, there will be no demand for the above courses in future.

7. *Lectures and tours.*—Fifteen special lectures were given to the students by various research officers during the session. B.Sc. (Ag.), Class III was taken on a tour of 15 days during October 1935, to Hagari, Bangalore, Mysore and Salem districts. B.Sc. (Ag.), Class II was taken in January 1936 to Northern Circars. The latter tour lasted 15 days.

8. *Examinations.*—The number of candidates that appeared for the B.Sc. (Ag.) examinations in 1935 and the results were as follows :—

	Number appeared.	Number passed.
First examination	30	26
Second examination	41	26 plus 11 who failed in one subject only and are eligible for attending B.Sc. (Ag.) Class III.
Final examination	26	23
Part II—Old Regulations	8	8

9. *Scholarships, prizes, etc.*—The Selection Committee recommended five scholarships to the first year students, three to Muhammadans and two to backward classes. One of the scholarship holders of 1934–35 having failed in the first examination forfeited his scholarship and this was later awarded to a deserving student of B.Sc. (Ag.), Class III. The merit scholarship was awarded to student H. Krishna Kumar, B.Sc. (Ag.), Class II. Thirteen prizes in the shape of cups, medals and books were awarded to successful students at the College Conference in July 1935.

10. *University.*—I attended two meetings of the Senate and two of the Academic Council. M.R.Ry. M. C. Cheriau Avargal, on appointment as officiating Government Entomologist resigned his membership of the Academic Council and his place was filled by the election of M.R.Ry. K. Raghava Acharya Avargal, Lecturer in Agriculture.

11. *College Council.*—The members appointed in August 1934 continued their membership of the College Council. Three meetings were held during the year.

12. *Miscellaneous.*—Under the orders of the Director of Public Instruction, Madras, all students attending the College were examined and passed free by the Group Leprosy Officer.

M.R.Ry. Rao Bahadur M. R. Ramaswami Sivan Avargal delivered the Travancore Curzon lectures at the Agricultural College in February 1936.

13. *Hostel.*—The general health of the students was not as good as in the previous year. There were several cases of fever, gastric trouble and more accidents on the sports field. Student K. K. Dharmarajan, B.Sc. (Ag.), Class II died suddenly on tour at Anakapalli Research Station of heart failure. Messing was carried on as in previous years.

14. *Students' Club.*—On the literary side the year began with the inaugural address delivered by M.R.Ry. T. V. Srinivasaraghavachariar Avargal, B.A., Retired Principal, Central Recruits school, Coimbatore, the subject of the address being "The importance of Agricultural Education in India." Four general body, four ordinary and two condolence meetings were held during the year. The Club Day celebrations were held on the 22nd February 1936 when Dr. S. R. U. Savoor, Principal, Victoria College, Palghat, presided over a large and enthusiastic gathering of students and friends.

15. *Games section.*—The athletic side of the students' club was active and practically all students took an active interest in games. The cricket team won the Rhondy shield and also the University Inter-Collegiate tournament, Trichur Centre. Two students were selected to play in the Madras University Cricket team. The College hockey team also won the Inter-Collegiate—Trichur Centre tournament. One student was selected to play in the University Tennis finals.

16. *Library*.—The library extension room on the ground floor was equipped with 12 double-sided book cases and a number of volumes were transferred from the main library upstairs to relieve congestion. Two thousand, three hundred and eighty-four books and publications were added during the year. Eleven thousand, four hundred and ninety-one volumes were loaned during the year an increase of 19 per cent over the previous year. Twelve additional periodicals were obtained and 898 volumes were bound by the Government Press, Madras. Eight hundred and twenty volumes were classified and catalogued and 14,000 cards added to the card index cabinets.

17. *College Day and Conference*.—The 24th College Day and Conference was held on 2nd and 3rd August 1935 under the Presidentship of Sir C. A. Souter, C.S.I., I.C.S., Revenue Member to Government. The College sports were held on the 4th August 1935 when Mrs. B. G. Holdsworth kindly gave away the prizes.

18. *Seed testing*.—Two hundred and thirty-six samples were tested and reported on for various officers.

19. *Veterinary Hospital*.—Four hundred and ninety-nine farm and 1,187 out-patients were treated during the year against 401 and 1,071, respectively in the previous year. Eighty-three major and 83 minor operations were performed excluding 95 castrations. All cows and calves in the Dairy Herd were tested for Johne's disease and two cows which proved positive to the test were destroyed. Eighty-two animals were protected against Rinderpest by the Serum Simultaneous method of inoculation.

20. *Farm Labourers' School*.—The attendance dwindled during the year. There were three part-time labour pupils in the morning and two in the evening classes. Sixteen boys attended the day school. The year ended with three pupils in the morning, two in the evening classes and 14 in the day school.

21. *Essential services*.—There was no further extension of the Estate electrification during the year and residential bungalows and quarters are still without this amenity. Plans and estimates for lighting and power installations for residential quarters, Freeman Building and Breeding Stations have been prepared during the year and submitted for sanction.

The demand for gas by research and teaching laboratories increased during the year by 15 per cent over last year: 497,000 cubic feet being manufactured and supplied.

Owing to successive partial failure of monsoons for the last two years the Estate water-supply has gone down and the supply has to be restricted to seven hours daily and difficulty is experienced in meeting the restricted supply. The daily consumption works out to 67,000 gallons as against 87,000 gallons in the previous year. The quality of the water is distinctly brackish and leaves much to be desired and the majority of the residents obtain their drinking supplies from outside sources.

The estate drainage system functions satisfactorily and ten flush out latrines were constructed at the students' hostel during the year, an innovation which should be extended as funds become available. The activated Sludge Plant was worked regularly but its capacity is much below estate requirements. Sullage and effluent were used for irrigation over a limited area during the year under report.

22. *Health*.—The general health may be regarded as fair. Measles and chicken-pox were prevalent at particular seasons, but no serious contagious disease occurred during the year. There were 24 births and five deaths recorded during the year. One hundred and sixty-five persons were vaccinated by the municipal vaccinator.

23. *Workshops*.—A large number of repairs were carried out during the year. A new circular saw bench was installed for cutting firewood for gas making.

The Falkamesam plant was worked throughout the year for treating junglewood for fencing and outside constructions. Two additional rubber tyred double bullock-cart were added to the farm equipment. There are now six rubber tyred carts on the farm and these have given general satisfaction for all classes of work. A new chaff cutter was purchased and fitted up in the Central Farm.

24. *Works*.—Repairs and works were done at a cost of Rs. 10,403 as detailed below:—

Civil works—Public Works Department grant.

	RS.
Repairs to residential buildings	9,665
Original works	738
Total ...	10,403

Departmental works.—Petty construction and repairs to non-residential buildings, roads and minor works were done at a cost of Rs. 9,999.

25. *Central Farm—Season*.—This was very unfavourable. Only 16.43 inches of rain was received during the year as against the average of 25.32 inches for the last 25 years. Both the monsoons were disappointing.

26. *Crops*—(i) *Cotton*.—Cambodia cotton (irrigated) was grown over 22.47 acres. The average yield of Co.₂ strains was 869 lb. per acre.

(ii) *Rainfed cotton (1934–35 crops)*.—Karunganni and Uppam was grown on 16.16 acres. Karunganni yielded 491 lb. and Uppam 290 lb. of kappas per acre.

(iii) *Fodder crops*.—The following varieties were grown and the average yield is noted against each :—

Periamanjil cholam	...	...	...	18,660 lb. per acre.
Maize	...	...	...	16,360 „ „
Guinea grass	...	...	...	48,071 „ „
Lucerne	...	...	...	24,302 „ „
Elephant grass	...	...	...	167,854 „ „

(iv) *Orchard and vegetables*.—A few more mangoes and oranges were added to the orchard area. The oranges and mangoes yielded well. As in previous year tomatoes again brought in the largest income from the vegetable area. The total income from this area is made up of—

	RS.	A.	P.
Fruits and plants	...	...	...
Vegetables	...	...	...
Flowers	...	...	...

(v) *Paddy*.—In spite of the adverse season the paddy crop did not suffer as in the previous year. An average yield of 3,445 lb. of grain and 4,493 lb. of straw was obtained.

(vi) *Pulses*.—Bengalgram did not fare well and yielded only 186 lb. per acre. Redgram was almost a complete failure.

(vii) *Ragi*.—E.C. 593 was the only strain grown this year. It gave an average yield of 2,032 lb. of grain per acre.

(viii) *Sorghum*.—Irrigated summer cholam occupied 21.92 acres. The average yield of grain for the white and yellow is 1,620 lb. and 1,340 lb., respectively.

Rainfed cholam (Periamanjil) was a partial failure yielding on the average only 120 lb. per acre.

(ix) *Sugarcane*.—Ten varieties were under trial. Co. 413 was the best, closely followed by Cos. 417, 213, 419, and P.O.J. 2875. The average yield was 48.5 tons of canes per acre.

(x) *Cattle*.—The condition of the animals was quite satisfactory.

27. *Botanic Garden*.—The work in the garden was continued on the same lines as last year. Some more varieties of hill roses were obtained and budded and most of them have begun to flower. Lessons in horticulture were given to the students as usual. The total receipts from the garden amounted to Rs. 228.

28. *Dairy*.—(i) *Dairy herd*.—The year started with a herd of 39 cows and ended with 41. There were 23 births including two pairs of twins. Two cows were destroyed being affected with John's disease. Nine cows and a bull were received from Hosur. Ten calves were transferred to the Government Agricultural Chemist. One old bull was castrated and transferred to the Central Farm,

fourteen calves to Hosur, one cow to the Agricultural Research Station, Kalahasti, and three cows were sold in auction. Fifty-two services by the bulls included 11 outside cows.

(ii) *Milk yield*.—Out of 29.2 cows on the average, 21.1 were in milk which yielded 15.4 lb. of milk per day. The daily average for the whole herd works out at 11.2 lb. of milk. The total yield of 119,245 lb. of milk was distributed as follows :—

	LB.	OZ.
Sold as whole milk	...	...
Fed to calves	...	...
Colostrum	...	...

17,838½ lb. of milk was separated as against 19,445 lb. 12 oz. of last year and 1,781 lb. of cream was obtained; of this 1,723 lb. 6 oz. was churned producing 950 lb. 11 oz. of butter. 52½ lb. of cream was purchased in connexion with the practical examination of the B.Sc. students. Of the total quantity of butter, 660 lb. 10 oz. was sold as such, 284 lb. 2 oz. was converted into ghee and 45 lb. 12 oz. was issued for milking.

(iii) *Pigs*.—There were nine in the beginning of the year. Nine piglings were born during the year out of which five died. The whole lot was sold before the end of the year.

(iv) *Poultry*.—Eight leghorns from Katpadi and four hens and three cocks from Hosur were added during the year. The year ended with 51 hens, 13 cocks and 78 chicken in all the five breeds together.

(v) *Eggs*.—Five thousand and ninety-eight eggs were handled during the year: of this 1,715 were sold for hatching, 2,785 for the table, 316 kept for hatching and 282 were fed to stock.

29. *Herbarium—Economic*.—The survey of plantains continued in Nilgiris, Bellary and Coimbatore districts. Two new varieties, one from Bellary and one from Kallar, Coimbatore district, were added to existing varieties. Four hundred and sixty-three suckers of various varieties were supplied to correspondents. Banana figs were prepared from eight varieties—the juicy varieties gave the best quality figs.

Experimental plots of ten fodder grasses were planted in the Botanic garden. *Panicum maximum*, Jacq. gave the highest yield closely followed by *Chloris Bournei*, Rang & Tad. On account of the unusually dry season it was found necessary to irrigate the plots occasionally. Information on economic matters was supplied to 61 correspondents while specimens of fruits, seeds and plants were sent to correspondents in various parts of India.

30. *Systematic*.—Seven hundred and sixty-five botanical specimens were identified during the year. Seven hundred and fifty-five were added to the herbarium mostly specimens received from Kew. Some specimen sheets were loaned to the Forest Botanist, Dehra Dun.

31. *Visitors.*—His Highness the Maharaja of Cochin, Sir R. K. Shanmugam Chettiar, Sir Charles Souter, c.s.i., I.C.S., Hon. Mr. P. T. Rajan, Minister for Public Works, W. B. Gurney, Esq., Entomologist, New South Wales, Prof. Tanaka, Taihoku, University of Japan, Mr. C. R. Reddi, M.A. (Cantab.), M.L.C., Mr. Markham, Secretary, Empire Museum Association, Pandit Hridayanath Kunzru, President of the Servants of India Society, Rao Bahadur B. V. Nath, Officiating Director, Imperial Institute of Agricultural Research, New Delhi, and two honorary visitors Messrs. A. K. D. Dharma Raja of Rajapalayam and V. I. Muniswami Pillai, Ootacamund, paid visits to the college and estate during the year.

R. C. BROADFOOT,
Principal.

(2)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, I CIRCLE, VIZAGAPATAM, FOR 1935-36.

I.—CHARGE.

M.R.Ry. C. Ramaswami Nayudu Garu, was in charge of the circle till the 20th of June 1935 when I returned from leave and took charge of the circle and continued till the end of the year under report. M.R.Ry. G. Jogiraju Garu was in charge of the Vizagapatam division throughout the year while the Rajahmundry division was in charge of M.R.Ry. M. V. Raghava Rao Nayudu Garu.

II.—AGRICULTURAL EDUCATION.

2. Agriculture as an optional subject is taught in S.S.L.C. and Intermediate classes at the Aska High School and the Rajah's College, Parlakimedi, respectively.

3. *Practical training in agriculture.*—Two students completed two years course in practical agriculture at the Agricultural Research Station, Samalkota, during the year. There are seven students under training at present.

III.—DEMONSTRATION.

4. *Season.*—The season was marked by a combination of adverse conditions and has generally been unfavourable except in the Godavari Delta where there was an unfailing water-supply for the main and the second-crop seasons. The prolonged hot weather coupled with scanty rainfall adversely affected the standing sugarcane, plantains, and green manure crops. *Punasa* crops were almost a failure in Vizagapatam district. Sugarcane had commenced to die out in certain parts of the circle. The already serious position was greatly accentuated by weak monsoons that prevailed during the year particularly in Vizagapatam division. The total rainfall was below the average in all the districts in the circle. The south-west monsoon was not only disappointing but unevenly distributed. The tanks and river channels did not get their usual supply of water in the Vizagapatam and Ganjam districts and as a result a very large extent of paddy area remained unplanted and in some of the areas planted with what little water was available, the crop withered and failed. The coastal taluks fared worst in this respect. The north-east monsoon was very short bringing in a heavy precipitation of about 6 to 7 inches in the course of three days causing some damage to the standing crops. This was, however, useful in checking a 'fungoid' pest of paddy which broke out in an epidemic form in West Godavari

district. There was practically no rainfall from the last week of October till the beginning of February. The prolonged drought during this period was responsible for the failure of dry ragi and other *paira* crops in the Vizagapatam district. In parts of Ganjam, special relief works had to be started to alleviate the consequent distress. The heavy rainfall received in the month of February delayed the harvest of sugarcane crop by about a fortnight, but it was however useful in solving the water problem in Ganjam district.

A. Crops.

(a) Paddy.

5. *Cultural improvement*.—As mentioned in the last year's report the chief items of improvement suggested in this connexion are the reduction of seed-rate and planting with thin sown seedlings. But in the Vizagapatam division work in this direction was, in general, very badly handicapped for want of sufficient and timely rains. In the Rajahmundry division, fair progress was made on account of favourable season. The area under thin-sown nurseries was 3,417 acres as against 1,912 acres in the last year in the Rajahmundry division while in the Vizagapatam division it fell from 4,763 acres to 3,865 acres. The area planted with such thin-sown seedlings came down similarly from 49,252 acres to 33,501 acres in the Vizagapatam and Ganjam districts while the area brought under this improvement in the Rajahmundry division was 38,148 acres, the total area being 71,649 acres.

6. *Methods of manuring*.—The practice of green manuring the paddy crop has become a common practice in the circle and the area is on the increase in the Godavari districts while there was a decrease in the Vizagapatam and Ganjam districts mainly due to failure of summer rains. It is estimated that about 29,975 acres were treated in this way. Some progress has been made with regard to the use of phosphatic manures in conjunction with green manure for paddy. Six hundred and fifty-nine acres were manured with phosphatic manures in the circle as against 368 acres in last year.

7. *Propagation and sale of seed*.—Paddy strains from Samalkota, Maruteru and Anakapalle stations continued to be popular with the ryots. In spite of the increase in the number of central villages and demonstration maistries in the Vizagapatam division appreciable progress could not be made in this direction on account of bad season. A quantity of 1,162 cwts. of paddy seed from the research stations was distributed in the circle and the area grown with this seed was 4,043 acres. The seed made available from the seed-farms was 20,097 cwts. covering an area of 80,902 acres. Taking the area under natural spread also the total area under improved strains was 210,688 acres. The area under seed-farms arranged during the year was 3,932 acres as against 5,130 acres in the previous year. The total production of seed from this area

is 52,475 cwts. In this connection the Assistant Director of Agriculture, Rajahmundry, reports that the progress in the spread of improved strains under seed-farm conditions has been handicapped on account of non-indenture system and that the department should purchase the seed produced from these seed-farms and distribute it to the ryots. This is quite unnecessary in view of the fact that the improved strains are very popular with the ryots and that there is an increasing demand for them as can be seen from an area of 82,800 acres which were brought under improved strains by the efforts of the ryots themselves during the year in the Godavari delta. It is hoped that better progress will be shown in this line of work in the coming season.

During the year a special paddy seed distribution campaign was undertaken in the famine area of Tekkali, Ganjam district, in co-operation with the Revenue Department. With the aid of takkavi loans granted to the ryots in this area 251 cwts. of seed were distributed to them.

8. *Other cereals—Ragi*.—Ragi strains 525 and 355 from the Agricultural Research Station, Anakapalle, for the first time were tried in Kovvur and Tadepalligudem but due to unfavourable season they failed. In the Vizagapatam district departmental seed of strain No. 525 was distributed to cover an area of 68 acres as against 84 in the last year while the area sown with the ryots' own seed was 646 acres against 985 acres in the previous year. Ragi No. 355 occupied an area of 44 acres.

(b) Sugarcane.

9. *Varieties*.—Co. 213 though successful in the uplands and in the lighter type of soils does not seem to yield to the same appreciable extent, as purple mauritius in the heavy soils of the Godavari delta and the area of its extension in this division seems to be restricted. In the Vizagapatam division Co. 213 and J. 247 are most popular while Co. 281 is not finding favour on account of its low tonnage. But Co. 281 and Co. 213 appear to be very good for ratooning. J. 247 occupied an area of 12,123 acres in the circle and this is mostly confined to Vizagapatam division. The area under this variety has gone down to some extent owing to the large increase in area under Co. 213 which has now spread over 5,063 acres. Other varieties such as Co. 281, P.O.J. 2878 occupied an area of 181 acres. The total area under improved varieties of cane was 17,367 acres during the year.

10. *Seed and cultural improvement*.—A quantity of 348,408 setts of departmental seed material equivalent to 40,130 whole canes was supplied to the ryots. Production of good seed material by growing a short crop was done over an area of 167 acres in the Vizagapatam division and 21 acres in Rajahmundry division as against 90 and 17 acres respectively, during last year. There appears to be an impression in Rajahmundry division that growing of a short crop for seed is unnecessary as planting and harvesting of cane synchronizes and top setts are available for planting. But

as there is a distinct advantage by using short crop seed material with regard to uniform germination and vigour over other seed-material, the growing of short crop is quite essential. Line planting of cane was done under departmental advice over an area of 7,307 acres and this was adopted by the ryots themselves in an area of 6,050 acres in the circle. Wider planting was adopted in 3,642 acres of which 2,377 acres were planted through the efforts of the department.

11. *Introduction of improved mills and jaggery manufacture.*—The construction of improved furnaces was continued as before and 525 Godavari furnaces and 9 Sindwahi furnaces were constructed during the year. Three hundred and twenty-seven improved mills were introduced of which 4 are power crushers. Six cream jaggery demonstrations were conducted and the keeping qualities of the material prepared last year do not appear to be satisfactory as the Assistant Directors of Agriculture report that the jaggery got soft and lost colour when stored.

(c) Fodder.

12. The scarcity of fodder on account of the severe draught experienced during the year in Vizagapatam district gave an impetus to the increase of the area under fodder crops such as cholam, sunnhemp and pillipesara in that tract. Seven hundred and eighty pounds of seed sufficient for 52 acres were distributed departmentally while 406 acres were grown with ryots seed. In the Rajahmundry division the introduction of pillipesara in the delta has helped a great deal in solving the fodder problem and the area under this crop has considerably increased during the year. It now occupies an area of about 16,000 acres. Sunnhemp as a 'pyru' crop after paddy is generally grown for fodder. Twenty silage pits were prepared in the Vizagapatam division while in Rajahmundry division this work was not taken up.

(d) Fruits.

13. The area under plantains showed an increase during the year though there was a general fall in the price due to greater area brought under this crop. The concession given by the Railway authorities for transport of plantains were not availed of by the ryots for want of direct export by the shortest route and for want of Agents in Northern India. The plantain from Godavari delta met also the needs of border taluks of the Vizagapatam district so much so there was a decrease in area under this crop. On the whole the area brought under the improved method of cultivation departmentally is 655 acres while the area under natural spread was 2,237 acres. Planting of other fruit trees such as mango, citrus, pine-apple, sapota, guavas, etc., was advocated and an area of 580 acres was planted with them.

(e) Oil-seeds.

14. A.H. 25 was tried for the first time and found to yield 14 per cent more than the local. The area under this strain, is

expected to increase in the coming year. Sowing of groundnut in every furrow instead of in alternate furrows was done in an area of 3,802 acres as against 1,554 acres during the last year in the Vizagapatam division.

(f) Fibre crops.

15. The main difficulty at present in connexion with the introduction of cambodia cotton in this circle is the absence of demand in the local market for the produce and the impracticability of its export to Bombay especially in the early stages when the total produce is found to be too small to be exported. Six hundred and twenty-seven pounds of seed were, however, distributed departmentally to cover an area of 76 acres. The irrigated crop gave an average yield of 741 lb. of kappas per acre while the rainfed crop yielded 208 lb. per acre.

B. Improvements.

16. *Implements.*—The usual demonstrations with improved ploughs were continued during the year. Though the season was adverse for this line of work, 1,994 demonstrations were conducted with improved ploughs as against 1,840 in the last year. The working of Guntaka was demonstrated in 462 cases against 577 in the previous year. Demonstrations given with other implements such as Planet Junior Hoe and buckscraper were 233. Five hundred and seventy-nine improved ploughs, 3 Planet Junior Hoes, 2 H.M. Guntakas, 2 Buckscrapers and 148 spare parts were purchased by the ryots. With the advent of Takkavi loan system for purchase of small implements 1,779 ploughs have been supplied to the ryots in the Vizagapatam division and 31 ploughs in the Rajahmundry division.

C. Livestock.

17. In the course of work on livestock, due importance was attached to the necessity for maintaining good breeding bulls for the improvement of local cattle. In the circle, 7 Ongole bulls and 3 Delhi buffalo bulls were maintained during the year under the premia scheme while 17 bulls of the same breed were maintained by the ryots outside the premia scheme. On the Agricultural Research Station, Anakapalle, 4 Ongole bulls and 1 buffalo bull were stationed for breeding purposes. Four hundred and eighty-two birds and 1,270 eggs of improved breeds of White Leg-horn, Rhode Island Red, Black Minorca and Light Sussex were supplied to the ryots. The Poultry Assistant has built a good stock of birds of improved breeds at the Agricultural Research Station, Anakapalle, besides attending to the poultry work at the Agricultural Research Station, Samalkota. He was also engaged during the year in doing the necessary propaganda among the ryots with regard to better methods of housing, feeding of birds and treatment of diseases. He has acquainted the Agricultural Demonstrators with the details of work for improving this side industry in the course of his tours in the circle. The marketing problems of the birds and eggs was also studied by him. Propaganda work on bee-keeping was pushed

on with the aid of the Entomological staff in the circle and enquiries on the subject are on the increase. Twenty-five bee-hiving demonstrations were conducted by them. Eleven colonies of bees were hived for the ryots in Vizagapatam division and 84 hives were supplied to the ryots in Rajahmundry division besides 12 honey extractors. With a view to introduce Lac industry in this circle, Lac insects were obtained from Ranchi and successfully inoculated continue on Anona and Ficus and Rain trees. Attempts will now be made to introduce Lac insects in suitable centres.

D. Manures.

18. (a) *Sale and production of green manure seeds.*—Work on the introduction of green manure crops was much hampered by the adverse season in the Vizagapatam division. A quantity of 12,439 lb. of green manure seed was sold departmentally during the year while the quantity made available locally was 1,109 cwts.

(b) *Farm yard manure.*—Much attention was devoted for the proper conservation of farm yard manure especially in the Vizagapatam division consequent on the appointment of the additional maistries. The total number of manure heaps covered and pits dug during the year were 21,161 in the circle. Eight hundred and ninety-one composts were made and 8,882 dry earth sheds were constructed. Though much time and energy is being spent towards this item of work it is unfortunate that this improvement does not seem to stay like other improvements.

(c) *Artificial manures.*—The use of artificials in conjunction with bulky organic manures was advocated as in previous years. The approximate quantities of artificial manures used in the circle were (1) two thousand one hundred and eighty tons of nitrogenous manures and (2) ninety-one tons of phosphatic manures—oil-cakes were used to the extent of 5,400 tons.

E. Pests and Diseases.

19. The chief pests and diseases tackled during the year were paddy leaf hopper, *Epilachna* and plant lice on tobacco and vegetables. *Laphygma* on ragi, groundnut-caterpillar, and beetles on gourds, smut on jonna, gummosis of citrus, wilt of betelvine, yam disease and tobacco stem-rot. Paddy leaf hopper appeared in a serious form this year in the West Godavari district and dusting with tobacco dust was found to be the best for bringing the pest under control. The hairy caterpillar pest was successfully tackled over an area of 700 acres of groundnut in Narasannapeta taluk and the total value of benefit accrued to the ryots thereby is estimated at about Rs. 8,000. Due to an outbreak of this pest in a serious form in Tekkali taluk the affected area was surveyed and the Pest Act was put into operation in this area. Spraying trials were conducted at Satyavaram for wilt and foot-rot of Beetlevine and the results obtained indicate that trenching and application of bordeaux mixture and kerol are helpful in preventing and checking the disease. Jonna seed for 1,044 acres was treated with sulphur

against smut. The usual advice for the control of budrot of palmyra was given to the ryots. A special survey was undertaken by the Mycological Assistant to find out the extent of the disease in the Godavari districts and it was found that the incidence of the disease is generally low and no special action seems to be necessary. Besides the above items a number of special calls for advice from ryots and departmental officers in the circle were also attended to.

F. Demonstration and Trial Plots.

20. *Demonstration plots.*—There were 2,417 demonstration plots as against 1,090 in last year. These plots relate mainly to improvements on paddy, sugarcane, ragi, groundnut and cambodia cotton. New trials were conducted on paddy, sugarcane, bengalgram, cholam and soy-beans in 589 plots as against 273 of last year.

21. *Trial plots.*—Trial plots with paddy strains such as Mypali No. 7, Mypali No. 30, Konamani No. 3-A, Bayyahunda No. 1, Sunkisannam No. 5 in Vizagapatam division, Punasa Konamani No. 83, Harisankar, Konamani No. 87, Basangi No. 61 in Rajahmundry division were conducted and the results were in favour of the strains over the local varieties, the increased yield ranging from 6.9 to 18 per cent. Under semi-wet conditions MTU. 4 gave 664 lb. of grain per acre where 'budama' failed to give any yield. Co. 213 under normal irrigation gave 7,725 lb. of jaggery while Co. 313, Co. 243, Co. 281 and P.O.J. 2878 gave 7,550, 6,850, 6,250 and 7,500 lb., respectively. But this trial requires to be repeated in bigger plots. Co. 351 a sorghum hybrid gave 9,167 lb. of jaggery as compared to Co. 213 which yielded 9,700 lb. under normal conditions while Co. 356, another sorghum variety gave 9,500 lb. per acre. Cambodia cotton yielded 741 lb. of kappas under irrigated conditions while as a rainfed crop it gave an average yield of 208 lb. per acre. Other trials were also conducted successfully with ragi, ganti, soy-bean, groundnut, sweet-flag and cholam strains.

IV.—JOINT WORK WITH THE CO-OPERATIVE DEPARTMENT.

22. The sale and loan society at Anakapalle was given the necessary help in effecting the sale of jaggery. During the year 18,000 maunds of jaggery costing nearly 2 lakhs of rupees were sold through the society. In addition to the Co-operative Sale and Loan Society organized at Bimilipatam last year for dealing with groundnut, one more was organized at Vizagapatam. The former dealt with 6,357 bags and advanced Rs. 10,699 as loans during the year, while the latter dealt with 5,727 bags and advanced Rs. 10,664. The value of the produce sold exceeded Rs. 20,000 in each case. The Sugarcane Growers' Co-operative Society organized at Bobbili in 1935 worked satisfactorily during the year and it started a temporary farm of 4½ acres mainly for the multiplication of sugarcane varieties. A new co-operative society of sugarcane growers was formed during the year at Kirlampudi.

V.—AGRICULTURAL ASSOCIATIONS.

23. The chief agricultural associations in this circle are the District Agricultural Associations of Ganjam and Vizagapatam and the Fruit Growers' Association at Vizianagram with branch associations recently started at Alamanda and Bhimali. The District Agricultural Associations contributed some amount out of their funds towards the district exhibitions held under departmental auspices at Narasannapeta and Palakonda during the year. A fruit show was conducted by the Fruit Growers' Association at Vizianagram in July 1935. One Agricultural Association has recently been organized in Rajahmundry division. In addition to the above, 22 village improvement associations were started during the year in the Vizagapatam division.

VI.—AGRICULTURAL EXHIBITIONS AND SHOWS.

24. Four exhibitions on a fairly big scale and 58 small exhibitions were held during the year in the circle. The district exhibitions held at Palakonda and Narasannapeta attracted a large number of ryots with their exhibits and created a great deal of interest in the minds of the agricultural population in the departmental activities. Awarding of gold and silver medals to the best exhibits was a special feature. It is pleasing to note that the public contributed a major part of the amount towards prizes. One fruit show was held at Vizianagram by the Fruit Growers' Association when a large number of fruits of different varieties were exhibited. The motor exhibition vans did not visit the circle during the year.

VII.—LECTURES.

25. Seventy-seven lantern lectures and 2,413 lectures without the aid of lantern slides were delivered during the year, the occasions being either in connexion with the shows and exhibitions or at jamabandi camps and local festivals.

VIII.—PUBLICATIONS.

26. In addition to the free distribution of leaflets 2,168 villagers' calendars and 292 bulletins were sold during the year.

IX.—LOANS.

27. Five hundred and five loans to the value of Rs. 3,000 were granted during the year as against 389 in the last year. Of these only two loans worth Rs. 12 relate to Rajahmundry division. These were utilized mostly for purchase of ploughs (Cooper No. 11). Persian Wheels were obtained in two cases with the aid of the above loans.

X.—RESEARCH.

Agricultural Research Station, Samalkot.

28. *Season.*—There was a total rainfall of 36.6 inches during the year against 37.8 inches the average of the last five years. The season on the whole was favourable for paddy and sugarcane crops.

29. *Paddy.*—Single plant selection and comparison work was continued during the year. One thousand three hundred and fifty-five selections were dealt with in half a dozen varieties. Kona-mani No. 87 from this station was tried for a second time in the districts in four centres and yielded 7.2 per cent more over the ryots' bulk.

30. Cultural experiments conducted during the year have confirmed the previous year's results that the bad effects of dry ploughing can be remedied to some extent by a puddling given before planting. For the intermediate season, trials of this year indicate that G.E.B. 24, Co. 2, Co. 4, Co. 5 and Co. 8 are likely to be suitable. Sanding paddy lands to improve the texture had a depressing effect on the yield for the first three years and thereafter a beneficial effect. The experiment on double planting was continued and the results were not significant. The manurial experiments showed that manuring with 6,000 lb. green leaf plus $1\frac{1}{2}$ cwt. of super per acre gave the best results as compared with other treatments.

31. *Sugarcane.*—Forty-seven varieties were under study and multiplication. Three new seedlings Co. 438, 439 and 440 were also tried for the first time. In the thick cane comparison trials, Co. 419 and 412 have yielded 68 and 29 per cent more than J. 247. Of the several varieties tried under single irrigation Co. 210, Co. 419 and P.O.J. 2878 withstood severe summer much better than the rest.

32. Though trench planting was found to be better than the bed-planting in point of yield in the previous year, the trials during the year did not confirm the above result apparently due to the unusual rainfall in April and May of this year though the crop did not lodge in the former unlike in the latter. Four and six weeks seedlings when planted have given better results than fresh sets. Ratooning trials have indicated that thin canes like Co. 213, Co. 243 and Co. 281 are better suited for ratooning than the thick canes. Co. 213 raised with minimum expenditure has given 15.5 tons of cane as against 17 tons of last year and it was subject to a severe attack of aleurodids.

33. *Plantain.*—Trial and multiplication of varieties was continued during the year. The study and classification of the varieties was taken up during the year.

34. *Other crops.*—Green and black-grams, chillies, soy-beans, fruit plants and vegetables were also grown on a small scale. Inoculated seed of soy-bean when sown gave a slight increase over the uninoculated seed.

35. *Miscellaneous.*—Work on poultry and sericulture was continued. Various items of research work connected with bee-keeping which is in charge of the Entomological Assistant are under investigation by him. Water requirements of paddy, sugarcane and plantain are under study.

VIZAGAPATAM,
29th April 1936.

B. RAMAYYA,
Deputy Director of Agriculture,
I Circle.

(3)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, II CIRCLE, GUNTUR, FOR THE
YEAR 1935-36.

I.—CHARGE.

I continued to be in charge of the circle during the year except from 20th May 1935 to 23rd June 1935 when I was on leave and M.R.Ry. U. Vittal Rao Garu, Assistant Director of Agriculture, Guntur, was in additional charge of the circle. M.R.Ry. A. Gopalakrishnayya Nayudu Garu continued as Assistant Director of Agriculture, Guntur, except from 11th April 1935 to 17th September 1935 when he was away as Superintendent, Livestock Research Station, Hosur, and M.R.Ry. U. Vittal Rao Garu acted in his place.

II.—DEMONSTRATION.

1. *Season*.—Summer was abnormally severe all over the circle. In Guntur and Kistna districts hot weather showers facilitated preparatory cultivation in most places. South-west monsoon was not only late by a fortnight but weak and irregular. The first three weeks of August were phenomenally dry and the following three weeks similarly wet resulting in poor yields. From middle of September, for all practical purposes, summer conditions prevailed again for a month. Luckily there were rains of the north-east monsoon, though late, in the second fortnight of October but groundnut one of the most paying crops ready for harvest was caught. There the north-east monsoon ended and thus failed practically. The famished winter crops suffered again under the downpour of unprecident rains and hails in February 1936—the only redeeming instance for the year being a good harvest of paddy and cotton.

In Nellore district summer was as usual severe with no rains to facilitate preparatory cultivation. Unusually south-west monsoon rains were received early in July 1935 and continued till the end of September facilitating the transplantation of paddy and sowing of punasa (early) crops in time. North-east monsoon rains, which are generally heavy in this district, were poor, the total fall being 12.09 inches against 24.82 inches average of the last sixty years. As a result the paddy crop under tanks and pyru crops were severely affected. It however rained accompanied by winds in February 1936, after all to disturb paddy threshing and damage the standing crop of jonna and fodder and green manure crops which were sown just then.

2. *Crops*—(a) *Cereals*—(i) *Paddy*.—In Nandigama, Kistna district, the seed rate in paddy nursery was reduced from 11 lb. to 6½ lb. per cent and demonstrated with success. For late sowing,

in Gudivada sub-circle the seed rate was reduced from 8 to 2-2/3 lb. per cent but the area of nursery required per acre was increased from 2 to 6 cents and thus robust seedlings were provided. There is no possibility of any further improvement in the paddy nursery of Kistna district. In Masulipatam sub-circle, Cooper No. 25 plough has been used instead of the country plough in preparing the land for paddy transplantation. By this a saving of Re. 1 per acre was demonstrated. The same demonstrated in Nellore and Kovur sub-circles with Cooper No. 25 and Meston ploughs gave a net profit of Rs. 1-12-0 per acre. Green manuring paddy has been on the increase in Nellore district, the total estimated area under this improvement being 8,420 acres. M.T.U. 8 and 7, G.E.B. 24, Konamani 3414, Atragada 4717, in Kistna and Guntur districts; G.E.B. 24, Co. 5, Adt. 5, A.E.B. 65, Adt. 11, Co. 2, Co. 1, Adt. 1, Adt. 3, Garikasannavari No. 925 and Punasa Atragada in Nellore district were the varieties demonstrated either because they give good yield or better quality rice. Seed of improved varieties was distributed to an area of 14,283 acres under departmental agency and 136,235 acres through natural spread. For multiplication of pure seed an area of 659 and 2,207 acres were arranged under seed farms and with improved seedsmen, respectively. Out of this area about 407 tons of seed have been preserved for seed for next season.

(ii) *Jonna*.—In Nellore district summer ploughing, the advantage of using Cooper No. 11 iron plough and manuring jonna were demonstrated with success giving a net profit of Rs. 2, Re. 1 and Rs. 2-8-0 per acre, respectively. T-6 jonna demonstrated in Atmakur sub-circle (Nellore district) in the pyru season gave an increased yield of 60 lb. per acre over the local. The seed of this variety is being multiplied as it is very useful as a fodder crop also.

(iii) *Wheat*.—Irrigated wheat of Coimbatore was introduced in Udayagiri taluk. It yielded at the rate of 1,800 lb. per acre which when compared to ragi (the local pyru crop) gave an increased income of Rs. 10 per acre.

(b) *Fibres*—*Cotton*.—Cambodia cotton as a dry crop is slowly spreading in good black soil areas.—the area sown being about 300 acres. Cocanada No. 171 was released for distribution and seed multiplication. It gave on the average 16 per cent increased yield over the local besides possessing some superior characters in ginning and fibre.

(c) *Fodders*.—In Guntur and Kistna districts growing crops for fodder in dry and wet lands is a common practice, except in some interior dry taluks where pillipesara for fodder in the dry lands has just been introduced. In Nellore district where pillipesara for fodder has been introduced by the department, the area has extended to nearly 21,000 acres.

(d) *Fruits*.—Introduction of varieties, and advice on the methods of planting, pruning, manuring, irrigating and control of pests and diseases formed the chief activity in this respect. The

department supplied to ryots 2,175 plantain suckers, 3,912 pineapple suckers, 8,890 mango grafts, 5,325 citrus seedlings, 4,696 coconut seedlings and nuts and 3,936 plants of various fruit varieties like sapota, grapes, guava, etc. As a result of departmental advice 296 acres were inter-cultivated and 135 acres were manured with concentrates like cakes and phosphates.

(e) *Oil seeds—Groundnut.*—A.H. 45 and 25 having done well, 2,080 lb. and 510 lb., respectively were distributed. They gave 42 per cent and 15 per cent increased yield over the local bunch and spreading varieties this year. H.M. Guntaka No. 2 demonstrated for lifting groundnut pods resulted in a saving of Rs. 2 per acre in Bapatla sub-circle and Re. 1 in Challapalli sub-circle over the local methods.

(f) *Spices—Chillies.*—Bulk 2 selected in the Agricultural Research Station, Guntur, out of the Pusa varieties and Pusa 9 as an irrigated crop did well having given 15 and 25 per cent more yield than the local. Seed will be multiplied.

(g) *Sugarcane.*—There was a set back in the area under this crop as the sugar factory at Vuyyur was not completed to receive the canes grown by the ryots in 1934-35—the total area in the circle being 4,985 acres compared to 7,900 acres in the previous year. Between Co. 213 and 243 the latter has been found to be yielding better and so its area is on the increase. Co. 281 planted in June gave only 16 tons of cane and 4,000 lb. jaggery per acre. P.O.J. 2878 also is becoming popular owing to its drought resisting capacity besides being one of the noble canes. The local variety—purple mauritius—having become susceptible to red-rot, J. 247 has been introduced in an area of 50 cents for trial in Tenali taluk. By the use of hoes like McCormick Deering Cultivator, Planet Junior Hoe and H. M. Guntaka No. 2 it has been demonstrated that a saving of Rs. 4-8-0 and Rs. 10 can be realized in inter-cultivation and irrigation, respectively. Bund forming implement and ridge plough were also demonstrated and proved to be useful from an economic point of view.

(h) *Drugs and Narcotics—Tobacco.*—Virginian varieties—cigarette type—are slowly spreading in Kistna district and has crept up to Kovur (Nellore district) via Ongole. The area in Kistna district has reached nearly 3,000 acres. H.S. 9 of the Agricultural Research Station, Guntur, having done well was distributed in the district—the area planted being 87 acres. It fetched a premium of Rs. 10 per putti of 500 lb. of cured tobacco owing to its superior quality.

(i) *Miscellaneous crops—Bamboo.*—The seedlings planted in the sandy soils of Bapatla (Guntur district) to see their response in the conditions obtained there have established themselves well and are promising.

Potatoes, davanam, English vegetables, cucumbers, korai grass, kapok, soya beans, and korakapalli for fencing have been introduced for trial in small areas from an economic point of view.

3. *Implements.*—The demonstration of implements in ryots' lands has increased from 739 of last year to 1,256 this year and the sales are given below :—

Iron ploughs	...	...	...	...	90
Guntaka	...	...	...	...	32
Roll easy-mhote wheels	...	...	...	...	41
Sprayers	...	...	...	...	2
Garden tools and implements	...	...	...	...	54
Spare parts	...	...	...	...	155
Archimedean screws	...	...	...	...	4
Chaff cutter	...	...	...	...	1
Water lifts	...	...	...	...	2

4. *Manures—Farm-yard-manure.*—The conservation of cattle manure, on improved methods, as in last year, formed an important part of work in the manure problem. The following are the improvements effected :—

Dry earth and trench system	...	...	899
Manure pits and heaps	...	...	819
Providing sheds over manure pits and heaps.	...	...	15

Composts.—Besides what was demonstrated on the farm, the manufacture of compost and poudrette was demonstrated in the holdings of the ryots in the different parts of the circle, the former in 11 places and the latter in four places.

Green manures.—This was encouraged wherever possible—particularly in fruit gardens. The total quantity distributed was 8.3 tons—the largest consumption being in Kovur sub-circle, Nellore district.

Concentrated manures.—There is an increase in the use of these manures which were largely used for sugarcane, turmeric, plantains and fruit gardens, etc. At the instance of the Agricultural Demonstrators the following manures were applied during the year :—

	TONS.
Cakes	948.2
Artificials	790.3
Bone-meal	3.0

5. *Pests and Diseases.*—There were in all 80 calls to effect remedy against the common pests and diseases of crops, fruit trees and vegetables. These were attended to by the Agricultural Demonstrators with the aid of Entomology Mycology Assistant stationed at Guntur. Except the control of gummosis on orange trees, leaf-spot and Pogachuru thegulu on turmeric, thrips on chillies and calocoris on cholam the rest were tackled successfully. Bud-rot of palmyra disease which broke out in Tenali taluk was handled successfully and further spread put an end to by the adop-

tion of the usual method of destroying the affected trees which amounted to 156. There was no occasion to enforce any of the Pest Acts. Sulphur dust treatment was demonstrated with success everywhere and 11,562 acres were sown with such treated seed as against 9,078 acres in the last year.

6. *Trial plots in the district.*—There were in all 12 regular trial plots in paddy and cotton. Atragada strain No. 4717 gave 6 per cent and 10 per cent increased yield over local in Bapatla and Bezwada sub-circles, respectively. M.T.U. 8 gave 14 per cent increased yield over local Vankisannam in Tenali sub-circle and Garikasannavari strain No. 4418 gave 32.7 per cent increased yield over the local second crop paddy (Kesari) in Naidupet sub-circle in the three years' trial. Preliminary to taking to regular trial plots 135 observation plots were laid with new strains of various crops. Of these only five deserve to be taken up for regular trial in the next season.

7. *Demonstration plots and areas.*—Demonstrations were conducted chiefly in ryots' plots in varietal, cultural and manurial methods in paddy, sugarcane, groundnut, cotton, tobacco, chillies, jonna besides those conducted with improved agricultural tools, implements, furnaces and insecticides, etc. The aggregate of the former was 629 against 241 of last year, and that of the latter 3,414.

8. *Co-operative work with other departments.*—With a view to accelerate the district work non-official co-operation being absolutely necessary the help of the Revenue Department was sought for in the formation of Firka Agricultural Associations with the Revenue Inspector as President, an enthusiastic educated ryot as Secretary and Agricultural Demonstrator as technical adviser. The Revenue Board having permitted this as an experimental measure in this circle 45 Firka Associations were formed so far and programme or work was arranged. It is hoped to turn out several times the present work, if, as suggested in the five years economic scheme, one demonstration maistry is stationed at every firka headquarters to push through with the work started by the demonstrator. Co-operation of the Revenue Department was also obtained in the disposal of sulphur dust packets, supplied by the Agricultural department—the total sales being 632 packets which could be used to treat seed necessary for 3,160 acres. The Agricultural department co-operated with the Health department in their National Health and Baby Week exhibitions by way of holding agricultural exhibitions and giving lectures on the importance of some of the improved agricultural methods for the proper maintenance of health. With the co-operation of this department, loan and sale societies were formed at Mypod (Nellore district), Nidubrole (Guntur district) and Kanumole (Kistna district). This department has co-operated with the Public Works Department in investigating and advising from an agricultural point of view the irrigation projects of Pratur and Gundlakamma (Guntur district) and Sarvepalli (Nellore district).

9. *Exhibitions and Shows.*—Sixteen agricultural exhibitions and shows were held, taking advantage of festivals, jamabandi camps, Health Week celebrations and Conferences of the Co-operative department—the outstanding one of all being that held at Nellore, where crops of educative and economic value were actually grown in small beds and the important methods of conserving cattle manure and the working of archimedean screw and sprayers were demonstrated. Sixty-seven lectures of which seven were illustrated, were delivered on important occasions. Motor exhibition vans did not visit the circle during the year.

10. *Improvement of Livestock.*—Premium is being paid on five breeding bulls (two Ongole and three Delhi buffaloes) for proper maintenance, to private parties. To introduce improved breeds of poultry 25 birds and 359 eggs of Rhode Island Reds, White Leghorns, Black Minorcas and Light Sussex were supplied to the ryots.

11. *Loans.*—The following are the particulars of loans sanctioned for the purchase of the various agricultural implements by the ryots :—

	RS.	A.	P.
Ploughs and plough parts	148	8	0
Guntakas	112	8	0
Roll easy mhote wheels	233	6	0
Total	494	6	0

12. *Publications.*—Leaflets were freely distributed as usual to literate public interested in agriculture. One thousand five hundred and nine Villagers' Calendars and 74 publications were sold.

III.—AGRICULTURAL RESEARCH STATIONS.

(a) *Crops.*—Over 500 units of jonna were under study. Five of these proved superior—J. 75 giving double the yield of local. Grading of jonna has again failed to give significant difference in yield. It was found that the top grain in a jonna earhead which is generally heavy—when used as seed—yields better than the bulk seed. Some plants intermediate between maize and its ancestor "teosinte" have been discovered. They seem to make good fodder types. Selection and economic work is in progress in sajja, korra and variga also. After three years successive study sajja has been found to be a suitable crop for the pairu (late) season also. Out of 66 selections from Coconadas cotton under study four proved superior. In Cambodia cotton four strains are under comparative study with local cotton under dry conditions. Cultural experiments under spacing, mixed cropping under dry conditions, testing of hybrid vigour in Cambodia cotton and rotation experiment in Coconadas are in progress. Out of four strains in cigarette tobacco under trial H.S. 8 has given 2.3 per cent increased yield over the local Harrison Special besides proving superior in quality. From

point of view of tolerance for thrips attack Bihar types of chillies Nos. 367, 390, 393 and 399 are found superior. Seed is therefore being multiplied from among them. Selection and economic work is in progress in chillies, redgram, wheat, bengalgram, soya beans and gingelly.

(b) *Implements*.—Mechanical seed drill and bund former were tested. The latter was found useful. The drawbacks experienced in the former were taken to the notice of the Research Engineer who promised to rectify them.

(c) *Livestock*.—A limited number of Ongoles and Delhi buffaloes have been bred and reared in the Agricultural Research Station, Guntur. 136 Ongole cows were maintained during the year. On the average 6.9 cows were in milk throughout the year as against 7.1 of the previous year. The total milk yield was 25,970.8 lb. with a daily individual average of 10.1 over milch cows and 5.1 over all the herd as against 12.1 and 6.9, respectively, last year. Cow No. 95-H, "Santha," gave during the year 4,841.7 lb. milk in 266 days with a daily average of 18.2 lb.

5.3 Delhi she-buffaloes were maintained during the year. 3.6 buffaloes on the average were in milk throughout the year as against 4.4 of the previous year. They yielded 18,805.2 lb. milk with a daily individual average of 14.6 lb. over milch buffaloes and 9.6 over the whole herd as against 19.4 and 12.4, respectively, last year. Buffalo No. 58 gave 7,560 lb. milk in 440 days with a daily average of 17.2 lb. Of all the exotic breeds tried so far Rhode Island Reds have been found to be suitable to this tract.

(d) *Entomology and Mycology*.—Study to combat *Calocoris* attack on jonna and selection of types resistant to blast on paddy are in progress.

GUNTUR,
15th April 1936.

T. BUDHAVIDHEYA RAO NAYUDU,
Deputy Director of Agriculture.

(4)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, III CIRCLE, BELLARY, FOR THE YEAR 1935-36.

I.—CHARGE.

Mr. A. C. Edmonds was in charge of the Circle up to 23rd December and I took charge on the 15th January 1936 forenoon from M.R.Ry. R. Swami Rao who was in charge during the interval. M.R.Ry. R. Swami Rao was the Assistant Director of Agriculture, Kurnool, during the year except for a period of leave of one month and twenty-seven days.

M.R.Ry. P. S. Manian held charge of the Bellary division during the year except for a period of leave of one month and 17 days.

II.—DISTRICT WORK.

2. *Season*.—Except in Kurnool district the rainfall during the year was above the average. In Cuddapah district the distribution was fairly satisfactory. The "Mungari" rains were generally favourable. The continuous rains of August and September delayed the sowings of groundnut in Anantapur district and of cotton in Nandyal valley. The Kurnool-Cuddapah canal was breached in some places and the supply to the wet lands became precarious in Kurnool and Cuddapah districts. The "Hingari" sowings were generally in time. The dry weather that prevailed from about the middle of October decreased the area under the second-crop paddy and depressed the yield of hingari cotton and jonna. The yield of mungari crop was just about normal.

A. Crops.

(a) Cholam.

3. T. 1, T. 6 and T. 12, N. 29/68 and N. 28/3 were the strains distributed during the year. Of these T. 6 continued to be popular in Nandyal tract and T. 1 in Bellary area, the distribution during the year being 2,135 lb. of T. 6, 2,603 lb. of T. 1, 4,160 lb. of N. 29/68 and 704½ lb. of N. 28/3 strains in Nandyal area. N. 28/3 and N. 23/10 of the Nandyal patcha jonna type did not thrive well in Gooty sub-circle. The natural spread of the popular varieties, viz., T. 6, T. 1 and N. 29/68 is fairly large.

(b) Paddy.

4. G.E.B. 24 continued to be the most popular variety on account of its cosmopolitan character. The area under this variety is estimated to be 22,600 acres as against 15,865 acres of last year. The increase in its acreage is largely due to its spread in Hindupur and Penukonda taluks in particular where the supply in tanks was

fairly good. Co. 1, Co. 5, and Co. 7 occupied an area of 600 acres in Cuddapah district. Adt. 3 has become popular as a second crop in the Kurnool division. Co. 2, Gunasale, Nagpur Sanna, C. 40 Bangarikaddi of Mysore, Konaikuruvai and Adt. 4, 9 and 12 for second crop are under trial. One thousand two hundred and sixty-five pounds of G.E.B. 24 paddy seed was sold by the department besides 311 lb. of other strains in Kurnool division. The ryots themselves did a good part of G.E.B. 24 seed distribution.

5. *Cultural improvement*.—Economic transplanting of paddy to replace the broadcast system has become popular on account of 40 to 50 per cent saving in seed rate besides the facilities the system affords to raise nursery even with a short water-supply in the right season. In most cases the sowing of dry nursery has proved successful.

6. *Manurial*.—About 12,000 acres were under various green manure crops in the circle. The seeds distributed by the department amounted to 15,430 lb. in Kurnool division and 2,169½ lb. in Bellary division. The rest of the area received the seed through local agencies.

(c) Ragi.

7. T. 8 ragi did well in Kurnool division. E.C. 593 did best in Kadiri and Tadpatri taluks of Anantapur district where T. 8 strain stands second to it. One hundred and fifty pounds of E.C. 593 and 739 lb. of T. 8 were distributed during the year against 600 lb. of T. 8 last year.

(d) Cotton.

(i) 'Westerns.'

8. The seed farm work was concentrated in nine villages round about Guntakal under H. 1 strain and consisted of 3,265 acres. 71,963 lb. of seed was recovered from seed farm ryots including a quantity of 2,554 lb. of stock on hand at the beginning of the year and 5,460 lb. transferred from the Agricultural Research Station, Hagari. Out of this 20,550 lb. was sold to the public and 48,970 lb. was distributed to seed farm ryots. The ginning is continuing. In Proddatur taluk about 50 per cent of the area of the 'Westerns' may be considered to be under H. 1 strain.

(ii) 'Northerns.'

9. N. 14 cotton seed farms were again started in Kurnool division in about 90 acres distributed in Nandyal, Koilkuntla and Sirvel taluks. So long as the firms grudge to pay satisfactory premium for the better quality of N. 14 lint, the progress it can make must necessarily be limited. The scientific workers are seriously on the look out to get a strain or mutant combining in it the high quality of N. 14 and the heavy yield of the Gadag mixtures which it is meant to replace.

(iii) 'Cambodia.'

10. Co. 2 strain of cambodia cotton was distributed this year to the extent of 6,382½ lb. Efforts made to grow it in wet land to replace paddy have been successful.

(e) Sugarcane.

11. Much impetus was given for the spread of the sugarcane by the successful demonstration of Sindewahe furnace and other methods to cheapen the cost of production of jaggery. The sugar factory at Hospet has roused a healthy competition among the cane growers to produce the heaviest crop. Expert advice was sought for selecting sites for growing canes and suggesting varieties for trial and multiplication.

12. The cultural improvement consisted of the use of ridge ploughs for making trenches and earthing up canes and the use of top sets planted wide apart in lines.

13. *Varieties*.—Co. 281 has done well and is becoming popular in Kurnool and Cuddapah districts while J. 247 B and Red Mauritius yet remain popular in Cuddapah district. The Pundia cane predominates as the variety under cultivation in Hospet and is being slowly replaced by Fiji B. Co. 281, Co. 290 and Co. 213. The poor quality of jaggery of Co. 213 makes it unpopular.

14. The manurial improvement consists in the use of Ammonium sulphate, super phosphate and Niciphos as supplemental manures for sugarcane, of which 405 tons, 23½ tons, and 25½ tons, respectively, were sold by the firms in the factory area.

15. *Jaggery making*.—Thirty-one demonstrations of cream jaggery making was conducted. The colour of the jaggery was well appreciated but the reduction in quantity stands in the way of its popularity. One hundred and twenty-eight Sindewahe furnaces were constructed during the year; thus in all there are over 200 improved furnaces now at work.

(f) Fruits.

16. Advice was given with regard to starting new plantations and improving the old ones. Control measures against pests and diseases were demonstrated. Considerable amount of good planting material was distributed.

(g) Vegetables and flowers.

17. Vegetable cultivation was encouraged. Tomatoes, cabbages, knolkhol and carrots are being cultivated at the instance of the department. The area is gradually increasing under these as well as under the ordinary country vegetables. Demand for vegetable seeds and advice regarding their cultivation was also met as far as possible.

B. Implements.

18. The use of iron ploughs, guntakas, sugarcane mills, chaff cutter, bund formers, mhote wheels and pruning tools was demonstrated. A very large number of demonstrations (563 in Kurnool

division and 1,058 in Bellary division) were conducted in all. The Rahat Persian Wheel worked with one pair of bullocks and easily replaces a Bellary mhote with two pair whenever a ryot can find funds for its purchase. The statement below shows the sale of implements and machinery :—

Ploughs	48
Spare parts	129
H.M. Guntakas	9
Mhote wheels	6
Chaff cutters	5
Bund former	3
Sprayers	1
Other implements	52

C. Manures.

19. Green manure seeds were sold in large quantities this year and the sales amounted to 2,169½ lb. in Bellary division and 15,430 lb. in Kurnool division.

20. Conservation of farm yard manure in the proper way was advocated as in previous years. Two thousand and five hundred pits besides 37 dry earth sheds, six loose boxes, and 14 byres were also maintained. One hundred and eighty-two units were handled by way of manufacturing composts. The Kurnool and Nandyal municipalities produced 1,700 and 250 cart-loads, respectively, of manure composted with night-soil while Bellary municipality produced 1,750 cart-loads of the same manure. Sixteen borehole latrines were put up. Oil-cakes and bone meal as manure had been used chiefly for fruit trees. The demand for bone meal has increased so considerably that a factory has been opened at Nandyal for crushing bones.

D. Insects including pests and diseases.

21. The Assistant in Entomology doing work in Mycology also toured 144 days and attended to 35 outside enquiries besides the concentrated work he did on fruit trees at the Fruit Research Station and other gardens at Kodur, especially with regard to Citrus leaf minor and mottle leaf disease. Most of his work outside was confined to Spodoptera on paddy, Semilooper on castor, Aphis on cotton, Hairy Caterpillar on cotton in red soil tracts, Seleretium and helementhospodium on paddy and smut on cholam. Minor pests such as Urentius echinus on brinjal, mites on cholam, boll worms on dry cotton, stem borer and case worm on paddy, mealy bug on betel vine, mildew on grapes, gummosis die back and aphis on orange, mango hopper and leaf spot on turmeric, etc., were dealt with. Control measures were also demonstrated. Special attention was paid to chilly thrips. A large emergence of zizyphus root flies was dealt with by a calix cover spray with sweetened sodium arsenate. This served to poison many of the flies.

22. Apiculture was given every encouragement. One colony at the Agricultural Research Station, Hagari, and another at the office of the Assistant Director of Agriculture, Bellary, continued to be active throughout the year. Ten and three-eighths pounds of honey was extracted during the year.

E. Demonstration.

23. The total number of demonstration plots was 674 as against 120 of last year. The demonstrations were in the nature of varietal, manurial and cultural improvements of Korra, ragi, groundnut, cholam, paddy, chillies, cotton and sugarcane.

F. Agricultural Organization and joint work with the Co-operative Department.

24. No opportunity was lost to co-ordinate the activities of this department with the Co-operative and other departments. There were three Agricultural Associations in Hospet of which the one at Kampli, was started this year. There was another at Hindupur. These organizations conducted exhibitions and held conferences by way of advertising the work of the department. Hindupur association staged a Telugu drama composed by Mr. Ambikacharan. Agricultural Demonstrator, Hindupur. The Bantanahal Agricultural Co-operative Society advanced Rs. 1,000 to its members for the purchase of groundnut seed. The Hagari Agricultural Improvement Co-operative Society was liquidated.

G. Exhibitions and Shows.

25. There were 20 exhibitions and two cattle shows held during the year. All the exhibitions were made as impressive as possible with specimens of improved crops, crop pests, etc. Implements were on the show as also charts and wall posters showing important facts about agricultural and livestock improvements and control of crop pests and diseases.

26. There were 30 lectures with lantern shows and 5 of them were in connexion with the ryots conferences held at jamabandi gatherings.

27. The exhibition van (Unit I) was repaired and the unit toured from 5th March to 31st March in Kurnool district visiting 18 villages in Pattikonda, Markapur, Nandikotkur and Sirvel taluks. In most places lantern lectures were delivered with the van show.

H. Improvement of Livestock.

28. There were four breeding bulls under the premium scheme and two more without it besides the bulls at the Agricultural Research Stations, Hagari and Nandyal. Efforts are made to encourage private individuals to purchase and keep more bulls under premium conditions. The District Board at Anantapur has recently passed a resolution to maintain one breeding bull for each taluk.

29. Seventeen birds of improved kinds and 18 eggs for hatching were distributed during the year.

I. Loans.

30. Rupees four hundred was distributed as loans for the purchase of agricultural implements and machinery. Efforts are made to increase such distribution for the purchase of small iron ploughs and tools.

J. Sale of publications.

31. One thousand five hundred and seventy-three villagers' calendars including 1,207 in Bellary division alone, and 71 priced bulletins were sold away to ryots besides a very large number of leaflets distributed free to selected people.

III.—RESEARCH.

32. Trials of new strains of crops in the ryots' fields was extended as much as possible so that their utility in different tracts may be assured before demonstrations could be conducted. These were conducted with the co-operation of farm and district staff. Six replications were made in all cases.

33. *Cotton*.—Thirteen trials each consisting of eight different strains were conducted in Kurnool division. Fifteen Mungari selections were in trial plots in five taluks in Bellary division. In the Mungari trials four strains, viz., E.B. 31, Verum 434, Verum 438 and Late Verum show great hopes. However the trials of last year will be continued leaving out the obviously poor ones such as Hirsutums, Nadams, Borbouns and Karunganni. Trials with bundled plots compared to the ryots' method were conducted in three places. The results indicate a 9 per cent increase in favour of the bundled fields with regard to cotton.

34. *Cholam*.—There were 14 trial plots in Kurnool division of which 11 alone could be carried to the finish. Each trial was made with five strains compared with locals. In six cases there were significant differences in yields. The variations in yield in different localities were however apparent. Therefore it is desirable to conduct further trials.

35. *Korra*.—Eleven trials each with five strains compared with locals were conducted. Only eight of them gave results of value. In six places the results were significant. Strain 132 gave higher yield in Cuddapah and Nandyal, as also strain 140 at Nandalur and strain 43 at Peddasettipalli of Proddatur taluk. This was also confined to Kurnool division.

36. *Ragi*.—E.C. 593 ragi was compared with T. 8, and H. 22 and locals in four places in Bellary division and E.C. 593 compared with locals in two places in Kurnool division. The results are significantly in favour of E.C. 593 except in Kurnool division where alone further trials will be conducted.

37. *Paddy*.—There were two varietal trials in Kurnool division with 10,998 Bk. and 11,340 Bk. The latter yielded more than local and indicated resistance to *piricularia*. In Bellary division trials with S. 246, G.E.B. 21, and short duration varieties from Aduturai, viz., Adt. 4, Adt. 9, Adt. 12 and Konakuruwai 5,868 and

5,834 were conducted in almost all the sub-circles. The yields of G.E.B. 24 and S. 246 were better than locals and they will be put under comparative trials again. Some selection work on Sannavadlu paddy is in progress in Anantapur taluk.

38. *Sugarcane*.—Varieties H.M. 320, 606, 607 and 609 and thin canes Co. 213, 281, 290, 355 and 364 and medium canes Co. 400, 402 and 408 and M.A. 21, H.M. 487 and 500, P.O.J. 2878 and Fiji B with J. 247 were under trial particularly in the Hospet sugarcane tract and Co. 213, 381 and M.A. 21, Co. 252 and 253 were tried in Cuddapah and Kurnool districts. The results are not yet to hand although the new varieties show much better growth.

39. *Citrus Manurial trials*.—Citrus manurial trial conducted at Appairajupet, Rajampet, Kodur, Nandalur, Giddalore and Panyam showed 10 per cent increase in favour of a mixture of 50 lb. of cattle manure, 5 lb. of bonemeal, 2 lb. ammonium sulphate, $2\frac{1}{2}$ lb. potassium sulphate and $3\frac{1}{2}$ lb. super phosphate against 200 lb. cattle manure per tree.

Dry Farming Research Station, Hagari.

40. *Season*.—The rainfall was 21.88 inches spread over 62 days of which only 36 were precipitations of 10 cents and more; the average for the past 25 years being 20.28 inches on 53 days. The mungari was well distributed and above normal while the hingari was rather in defect.

41. *Physiological and Ecological studies*.—The root system of mature *Setaria* plants are of two main groups. The many tillered plants with non-plaited ears have a root system of about two feet deep, while the few tillered having ears with a plaited look have greater lateral spread confined to the top six inches only. The farm yard manure encourages root growth. The root system of sorghum, when the growth phase was almost complete, showed that the compact headed varieties to have greater lateral spread than the loose panicle, which have a deeper system. The mature "earless" sorghum plants have a poor root system. Investigation on the moisture necessary for the optimum germination of *Setaria* is in progress.

42. *Cotton*.—Attempts to get a better type than H. 1 by pure line selection being not fruitful, *inter se* crosses were effected between H. 1 and 1162 and H. 1 and Surat 1027 A.L.F. as they are superior to H. 1 in quality. It is common to find a few plants among the H. 1 outside the station having "naked seeds," but they are absent in the crop of the station. To know the work of such plants, strip trials were laid with H. 1 for a comparison. The mean acre yield was almost equal to that of H. 1, while the ginning percentage of H. 1 is 31.7 the 'naked' had a low figure of 25.6.

43. *Millets*.—Sorghum was sown in 64.24 acres. The strain T. 1 from the bulk area gave an acre yield of 503 lb. grain and 1,240 lb. straw, while the figure for T. 12 was 685 lb. grain and

1,728 lb. straw. Attempts to get a more drought resistant type than T. 1 or T. 12 are made and during this year 189 units were intensively studied.

44. The comparative trials of *Setaria* strains were in their second year. The results were not consistent with those of the previous seasons. Three strains are worth a trial in the district in the next year.

45. Ragi was grown under irrigation. Along with E.C. 593 and T. 8, two short duration types from Anakapalle Nos. 355 and 525 were tried. Fortnightly planting of these types showed that the Anakapalle strains do well only if planted by the 15th May, and that E.C. 593 is the heaviest yielder if planted up to 15th July.

46. *Other crops*.—The improvement of Safflower, the main oil seed of the tract, and of bengalgram were continued. The yield of bengalgram compared with that of Soya bean gave 212 lb. and 98 lb., respectively, per acre.

47. In 1.50 acres 22 sugarcane types were grown of which 15 were of the thick types and 7 of the thin group. Co. 419 and 421 were promising, besides H.M. 606 and 607 from Hebbal.

48. *Agronomy*.—The advantage of bunds was studied for a third year. There was an increased yield of 35 per cent more grain and 30 per cent more straw by bunding. The Bombay Dry Farming practice was compared a second time with the local in adjacent one acre plot. Though the former gave a higher return, the increase is not commensurate with the extra cost of cultivation.

49. As a 18-inch spacing for sorghum is conducted as advantageous, and as the cultivator uses the same drill for sowing both cotton and sorghum, with a 36-inch spacing between rows of cotton. This is more advantageous than the 27-inch spacing.

50. The most advantageous of the proportions in the local pulse mixtures of last year was tried again with *Setaria* and *sorghum*. Four lines groundnut with one of *setaria*, and five lines of *sorghum* with one of bengalgram seem to be most favourable in money return.

51. Cambodia cotton strain Co. 2 when planted on the 1st July gave a yield almost thrice of the September planting, while the 1st of August plot's return was nearly twice that of the 1st September plot.

Agricultural Research Station, Nandyal.

52. The station was in charge of M.R.Ry. K. Rama Rao during the year.

53. *Season*.—There was a rainfall of 31.48 inches distributed over 69 days as against the average of 28.72 inches in 70 days. Early sowings were facilitated and fodder *jonna* suffered from drought but cotton sowings had to be delayed on account of heavy rains.

54. *Cotton*.—Out of five strains compared with N. 14, local Gadag seems to have approached it in quality and outgrown it in both ginning percentage and yield by 2 per cent and 29 per cent respectively. Further attempts to isolate better type to replace N. 14 are being made.

55. *Cholam*.—None of the collections made and tried with N. 28/3 has fared to rank with it though a few of them excelled the old strain T. 6.

56. *Groundnut*.—Bunch, local and Saloom were tried one with the other in which Saloom shows a significant increase of 197 lb. per acre.

57. *Soya beans*.—Soya beans treated with bacteria and untreated were compared one with the other and the results do not indicate anything in favour of the treatment.

58. *Pillipesara*.—Selection work in Pillipesara was started.

59. *Medicinal plants*.—A few medicinal plants such as Tinnevely Senna and Uttareni were tried. Tinnevely Senna failed.

60. *Hedge plants*.—*Prosopis juliflora* grown as hedge plant showed vigorous growth.

61. *Glyricidia Maculata* introduced from Ceylon shows remarkable adaptation to the soils here producing abundant green leaf. The leaves are not eaten by goats or buffaloes. The plant is expected to serve as a supplier of green leaf to paddy fields and as a hedge plant.

62. *Composts*.—Composting all farm wastes to form manure was continued with very good results. The materials used were cholam stubbles and mixed waste each treated separately with single and double dose starter. The quality of the produce seems to be satisfactory although the cost of production does not at all encourage spending labour on raking and waterings though without them it may take much longer time for the stuff to get ready for use.

63. *Manurial experiments*.—Manurial experiments on cotton with ammonium sulphate and super with and without cattle manure applied directly to cotton did not produce results in favour of it. In indirect manuring the results are encouraging.

64. *Mixture and Rotation*.—Mixture of sorghum with pillipesara has given results in favour of a pure crop of sorghum. Pillipesara mixed with sorghum depresses the yield of sorghum straw.

65. Rotation trials to introduce groundnut between *jonna* and cotton making it a three course was started.

Fruit Research Station, Kodur.

66. The Fruit Research Station started work on 1st March 1935. The station was in charge of a farm manager until 3rd August 1935 when the Superintendent Mr. K. C. Naik joined duty and the research work of the station was commenced on a serious scale.

67. *Season*.—Rainfall received during the year is 25 inches in 67 days. The season was generally favourable for fruit growing.

68. The lay out of the station area is nearly finished and wind breaks and hedges have been planted.

69. The Superintendent has undertaken the survey of the orchards of the Presidency and Mysore in the course of which he is collecting material for planting. Planting material of reputed varieties were also obtained from other parts of India. Thus 979 buds from 35 selected citrus trees of merit of South India and 1,794 buds of reputed citrus varieties of Bihar, Bangalore and Poona were obtained for propagation. Two thousand three hundred and ninety plants of citrus and 879 mango seedlings were grown to serve as stocks, 172 cuttings of 10 varieties of grape vines from Punjab, Bangalore and Krishnagiri were obtained and planted.

70. Forty-six thousand one hundred and eighty-four citrus seeds from 174 single tree selections and 1,120 stones from eight different mango trees and 965 seeds of ten varieties of papayas were sown during the year.

71. *Budding*.—Seven coolies were given preliminary training in budding and inarching. Six hundred and seventy-six *kitchili* and 552 *gajja nimha* seedlings were budded on. The latter seems to be better. One thousand and twenty-six seedlings of various ages were inarched to 69 grafted trees of 25 varieties.

72. Studies with regard to different methods of budding and germination of mango stones, periodicity of bearing of different plants, individual flowering and shooting records of different varieties have been commenced.

73. An exhibition which attracted material from various parts and over 3,000 visitors was held on the occasion of the formal opening of the Fruit Research Station by the Honourable Minister for Public Works. This also procured a large amount of material for planting purposes.

BELLARY,
12th May 1936.

K. UNNIKRIISHNA MENON.
Deputy Director of Agriculture, III Circle.

(5)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, IV CIRCLE, FOR THE YEAR 1935-36.

I.—CHARGE.

The year under report saw several changes in the charge of the circle as well as in Cuddalore division. Messrs. C. Narayana Ayyar, K. Unnikrishna Menon and myself were in charge of the circle during the year; while Messrs. K. T. Bhandary, C. Ramaswami Nayudu and R. N. K. Sundaram in turn held charge of Cuddalore division. I also held additional charge of Cuddalore division for a few days. Mr. Kanti Raj was in charge of Vellore division throughout the year except for a fortnight in December 1935 when he went on leave and handed over charge to Mr. K. Unnikrishna Menon. Three new sub-circles were opened, viz. at Gingee, Wandiwash and Chengam. Nine new demonstrators were posted to this circle, while one was transferred to VIII Circle.

II.—AGRICULTURAL EDUCATION.

The school at the Palur Agricultural Research Station worked satisfactorily throughout the year. The cub-pack started last year continued to do some good work.

III.—DEMONSTRATION.

(a) *Season*.—The average rainfall during the year under review was as shown below :—

	1933-34.	1934-35.	1935-36.
	INCHES.	INCHES.	INCHES.
Chingleput	41.45	39.23	42.68
South Arcot	44.94	43.29	42.91
North Arcot	34.18	32.84	41.52
Chittoor	31.49	29.89	35.58

The average rainfall was below normal in Cuddalore division while it was above in Vellore. Summer showers were disappointing. The south-west monsoon was late for sowing the dry crops and unusually heavy in August in parts of Vellore thereby damaging crops. The north-east monsoon was fair in Cuddalore division, while the heavy rains in October in Vellore interfered with the late sown crops. However the tanks received full supply for both samba and Navarai paddy.

(b) *Crops—Cereals*—(1) *Paddy*.—As heretofore there was great demand for departmental seeds of paddy and every endeavour was made to supply pure and good seed to the ryots. Forty thousand one hundred and thirty-six pounds of seeds were sold to the ryots during the year as against 31,340 lb. in the previous year. Seed farms were also arranged in Cuddalore division to multiply the departmental strain for distribution. The area under seed farms was 133 acres and 119,750 lb. of seeds were made available for sale

and distribution to ryots in Cuddalore division. In addition to the distribution of improved seeds, attention was also paid to better methods of ploughing with suitable iron ploughs, sowing of thin nurseries and economic planting and raising of suitable green manure crops like Kolinji, Sunnhemp and Indigo. The details of the seed distributed and the area grown are given below :—

Quantity sold in lb.	Area in acres.
42,806	2,529

The demand for green manure seeds has increased to such an extent that in some places a few merchants have come forward to deal in these seeds.

(2) *Ragi*.—E.C. 593 continued to be popular in both the divisions and gave better yields than the local ragi. However there is some difference of opinion amongst the ryots regarding the usefulness of this strain. Some complain that this strain takes about a fortnight more than the local. However on the whole the area under this is gradually on the increase. One thousand seven hundred and sixteen pounds of E.C. 593, 20 lb. of E.C. 1507 and 77 lb. of H. 22 were sold to ryots. E.C. 1507 an irrigated improved strain and H. 22 dry ragi were also introduced. No conclusive results have yet been obtained.

(3) *Cholam*.—The following strains were issued for trial in Vellore division.

Irrigated—A.S. 367, A.S. 2095, T. 1 and T. 12.

Dry—A.S. 1093, T. 1 and T. 12.

A.S. 367 strain which did well last year did not do so well during this year. No definite results were obtained for the rest as the same were spoiled by the heavy rain or badly affected by smut.

(4) *Fibres*—(i) *Cotton*.—On account of favourable prices of lint, its cheap cost of cultivation and the fall in prices of groundnut and paddy, the area under Cambodia cotton is steadily increasing in Cuddalore division. In South Arcot district alone the area under this has gone up to 3,600 acres during this year against 2,700 acres of last year. It is also grown as a mixed crop with rainfed groundnuts in parts of Cuddalore. During the year 6,085 lb. of Co. 2 and 97 lb. of Co. 7 seeds were sold for sowing purposes. On account of the absence of ginneries and local market in Vellore division, the area is not on the increase there.

(ii) *Sunnhemp*.—There is a small area under sunnhemp grown both for fodder and seed. Fibre extracted mostly in Trivellore is solely intended for local consumption and the seed is either sold locally or sent elsewhere.

(5) *Fodder*.—Introduction of fodder crops like Elephant grass, guinea grass, and fodder cholam was continued and 15,625 grass slips, 1,751 lb. of cholam seeds and 3½ lb. of lucerne were supplied to ryots.

(6) *Fruit trees*.—Necessary advice regarding the layout of gardens, selection of suitable young plants, their planting, pruning, manuring and control of pests and diseases were given to those who were interested in the maintenance of old or starting of new orchards.

During the year the following were supplied to the applicants :—

Sathgudi orange plants	...	...	...	77
Mango grafts	...	...	...	840
Coconut seed nuts	...	...	...	2,246
Sapotas	...	...	...	2
Plantains	...	...	...	121

(7) *Oil-seeds*—(i) *Groundnut*.—This is an important crop of this circle and especially so in the South Arcot district. Advice regarding its proper rotation with gingelly and cereals was given to the ryots. A.H. 25 was popular both in Cuddalore and Vellore divisions. There is also a keen demand for the seed of A.H. 45 in Vellore division. Two thousand nine hundred and thirty-three pounds of A.H. 25 groundnut seed was distributed to ryots mainly for seed multiplication.

(ii) *Gingelly*.—Strain S.I. 46 was distributed in Cuddalore division and has been found to be comparatively better than the local variety. During the year 10 lb. of seed was distributed and the area sown was 3 acres. S.I. 89 is still under trial in Vellore division.

(8) *Wheat*.—One hundred and twenty-five pounds of Pusa wheat No. 101 was introduced in Chittoor district. However on account of rust, the trial was not conclusive.

(9) *Potato*.—Twenty-five maunds of Great scot and Royal kidney potato tubers were obtained from the Nanjanad farm and tried in Madanapalle and Palmaner taluks. It is reported that fairly good yield was obtained and the ryots are growing the same again.

(10) *Sugarcane*.—As reported last year the area under it is on the increase and the varieties recommended by the department are becoming more popular. Several new varieties like Co. 281, P.O.J. 2878 and Co. 419 are being introduced in Cuddalore with a view to replace Fiji B. and in Vellore division Co. 281, Co. 213 and Co. 243 are being introduced to replace the local red and striped mauritius. The chief reason for the extensive cultivation of sugarcane in South Arcot is the existence of the Nellikuppam Factory and the new factory which is shortly to be started in Vellore division may give some impetus in this direction. As already reported Sorghum crosses have not found favour with the ryots and therefore they have abandoned their growing. The statement below shows the total area and the number of setts distributed during the year.

Number of setts distributed.	Total area in acres.
213,000	11,364

In Cuddalore, the area under short crop has increased to 51.50 acres as against 31.85 of last year, mostly under Co. 281 and P.O.J. 2878. Besides introducing improved strains and extension of sugarcane cultivation in localities where favourable conditions exist, better methods of cultivation such as growing of green manure crops and ploughing them in, opening deep trenches 3 feet apart and 9 inches deep with ridge ploughs, proper planting of setts from the top half of the cane, construction of sindwahe furnaces, better preparation of jaggery and also cream jaggery were demonstrated.

Seed farms.—With a view to produce large number of setts in each taluk without having to get them from outside by paying heavy transport charges, seed farms were organized for Co. 281 and P.O.J. 2878 in Chingleput and Conjeevaram taluks.

(c) *Implements.*—Practical demonstrations of improved implements were held in a large number of villages as a result of which large number of implements were sold to ryots. It will thus be seen that the departmental demonstrations of improved implements in the villages are producing definite results. But for economic reasons the sales of costly implements like Victory plough, mhothe wheels, cooper No. 11, Kirloskar 14, etc., would have been still greater.

(d) *Manures—Preservation of cattle manure.*—The proper storage of farm yard manure, conservation of both urine and dung by loose box and dry earth system were advocated. The statement below shows the result of the work done in this connexion.

Nature of system adopted.	Number constructed during the year.
Manure pits	1,559
Dry earth sheds	127
Loose box	7
Composts	18

(e) *Pests and diseases.*—The demand for advice to deal with insect pests and diseases from the ryots is on the increase. A number of cases are dealt with by the demonstrators concerned and in serious cases the Mycology and Entomology Demonstrators tackled the problem. Operations for stem bleeding disease spraying with Bordeaux mixture for die back on citrus, use of light traps for sugarcane borers and spraying with tobacco decoction and fish oil soap against insects in vegetables, etc., were chiefly demonstrated.

(f) *Pest Act.*—The annual appearance of Hairy Caterpillar on groundnut in Tirukoilur, Kallakurchi, Vriddhachalam, Tiruvannamalai and Polur taluks continued this year. The Pest Act was enforced to control the pest with the usual special staff. New appearances were noticed in Chidambaram and Tindivanam taluks of South Arcot and in nearly all the taluks of the North Arcot district; therefore these areas were also included in the Pest Act.

Water Hyacinth.—On account of prompt action, the pest has been reduced considerably.

(g) *Trial plots.*—Sixty-two trial plots were organized in the circle for paddy, sugarcane, groundnuts, ragi, cumbu, cholam, tobacco, wheat, and gingelly. It is seen from the results that in most cases the yields of improved strains were favourable.

(h) *Demonstration plots.*—(i) One hundred and seventy-five demonstrations were held in connexion with better methods of preparing jaggery and in this connexion 218 sindwahe furnaces were constructed for the ryots. Ten demonstrations were given in making cream jaggery.

(ii) Six hundred and sixty-one demonstration plots were laid out all over the circle consisting of manurial, cultural, varietal and spraying in connexion with the following crops: Paddy, sugarcane, groundnut, cotton, ragi, gingelly and cholam.

(i) *Joint work with the Co-operative department.*—Two better farming societies were organized in Vallipuram, Chingleput taluk, and Kaliyanur, Conjeevaram taluk. The groundnut marketing warehouses started at Cuddalore, Tirukoilur, Vriddhachalam and Tiruvannamalai continued to work. A great deal of propaganda was done advising ryots to sell their produce through the warehouses instead of through middlemen and mandy merchants. 8,312.926 candies of groundnut kernels were handled as against 6,749.38 candies of last year.

Crop-loans.—The statement below gives figures of loans granted and collected by primary co-operative societies in South Arcot district during the last four years:—

Taluks.	Loan issued.	Balance of loan for the last three years and loan issued.	Loan collected.	Balance at the end of the year.	Loan issued.	Balance of loan for the last three years and loan issued.	Loan collected.	Balance at the end of the year.
	RS.	RS.	RS.	RS.	RS.	RS.	RS.	RS.
Cuddalore	13,574	27,659	11,733	15,926	5,774	21,630	8,042	13,588
Vriddhachalam ..	2,759	10,703	4,389	6,314	3,881	10,195	4,051	6,144
Tirukoilur	..	1,070	941	129	1,213	1,343	85	1,158

(j) *Exhibitions and shows.*—Sixteen exhibitions were held during the year at important fairs and festivals. As usual the department participated in the annual Park Fair Exhibition at Madras organized by the South Indian Athletic Association.

(k) *Lectures.*—Fifty-two lantern lectures were delivered during the tours of the demonstrators. As usual ordinary lectures were held during Jamabandi conferences.

(l) *Motor Exhibition Van.*—The Motor Exhibition Van, Unit No. III, toured for 52 days in the Cuddalore division visiting 51 villages. Demonstrations and lectures were given at halting places and were well attended. Owing to the break down of the van, it was brought to Madras for repairs and therefore it did not tour in Vellore division and also could not complete the whole programme in Cuddalore division.

(m) *Improvement of Livestock—Breeding bulls.*—In all there were 27 bulls maintained including bulls that are maintained by the department at the Veterinary College, Madras, Veterinary hospitals in the districts, and also those maintained by private individuals under the premium scheme. Out of these 13 bulls were maintained under the premium scheme. One thousand two hundred and sixty-two services were performed by the bulls during the year. The Assistant Agricultural Demonstrator, Livestock, in charge of the breeding bulls at the Veterinary College made 326 calf inspections as against 350 of last year and continued his weekly inspections of General Hospital dairy and advised the contractor and milkmen about clean method of milking, etc.

(n) *Poultry.*—Introduction of improved breeds of Poultry in the villages was taken up and about 35 dozens of setting eggs of Rhode Island Red, White Leghorn, Black minorco and Light Sussex were distributed.

(o) *Bee keeping.*—Bee keeping work was taken up in right earnest about the end of the year and a special trained messenger was appointed for the purpose and he worked directly under the supervision of the Assistant Agricultural Demonstrator, Entomology. Fourteen colonies were successfully hived and are thriving well. Arrangements have been made to domesticate these at the Guindy Government House gardens prior to meeting demands from the public for live colonies. In addition, there were five hives working in Cuddalore division, while three in Vellore. It is a very interesting work and the ryots are gradually going in for it.

(p) *State loans.*—The grant of loans under the revised loan rules for the purchase of ploughs and implements continued during the year and was availed by a large number of ryots. Five hundred and ninety-five ryots took advantage of the takkavi loans and Rs. 6,210-10-0 were disbursed to them for the purchase of implements and spare parts.

(q) *Sale of publications.*—The following publications were sold :—

Villagers' Calendar	...	...	...	1,804
Bulletins	...	...	...	114
Leaflets were distributed free.				

(r) *Korai cultivation.*—Owing to water scarcity and fall in price of finished article and raw material, the area has dwindled. It is now only 178 acres as against 179 acres of 1931-32, 196 acres of 1932-33. However the area in 1933-34 was only 98 acres which is less than the present year. Figures regarding 1935-36 are not yet available.

IV.—MISCELLANEOUS.

Demonstrators in Mycology and Entomology.—The Agricultural Demonstrator, Mycology was on tour for 189 days during the year and was engaged in attending to the special reports of

fungus diseases of crops received from the ryots and the District Work Officers. He was in charge of groundnut hairy Caterpillar Pest Act work in a portion of Vriddhachalam taluk. He investigated and dealt with—

Wilt diseases of sugarcane, betelvine, plantain, casuarina and citrus as well smut on cane, bleeding disease of coconut and palmyra trees and 'mottle leaf' disease of oranges, etc.

The Assistant Agricultural Demonstrator, Entomology toured for 197 days during the year and attended to 52 calls for help and advice against insect pests. He successfully worked the Hairy Caterpillar Pest Act in Polur taluk. He investigated and dealt with the following major pests :—

- (1) Spodoptera, a stem borer and rat damage on paddy.
- (2) Rhinoceros beetle and Nephantis attack on coconuts.
- (3) Mites attack on castor crop.

In addition the minor pests on gingelly, cotton, vegetables and flower plots also received his attention.

Bee keeping work was also taken up in right earnest. He and the Agricultural Demonstrator, Mycology also attended the Madras Park Fair Exhibition.

AGRICULTURAL RESEARCH STATION, PALUR.

A total rainfall of 42.19 inches was received against 50.36 inches, the average for the last 30 years. Summer months were very hot and rainless. Though the south-west monsoon was late, the rainfall was slightly above normal. The rainfall in the north-east monsoon was 5.50 inches below the normal. But the season on the whole was fair for all the crops except paddy which suffered severely from blast.

Paddy.—16.03 acres were under paddy during the year of which 3.33 acres were under double crops and 1.12 acres were under nurseries.

Green manure crops gave an average yield of 9,747 lb. of green leaves per acre. The first-crop paddies gave an average yield of 3,140 lb. which was 11.8 per cent above the ten years average. However due to piricularia disease, samba or the main crops yields were below normal. As in last year, selection work was in progress in five of the important local varieties. Local garudan samba No. 43 has done well in many of the trial plots and gave 8 to 10 per cent above the normal.

Sugarcane.—6.70 acres were under several varieties of which 0.75 cents were intended for seed multiplication by short crop method. In the early stages thick canes suffered more than the thin canes. Pyrilla pest appeared in a milder form this year. An average yield of 31.57 tons per acre was obtained.

Ten varieties were tried in strips in the garden lands. Co. 419 topped the list closely followed by P.O.J. 2878. In the wetland

comparative trials, Co. 281 and 247 B. have done well as in previous years. Thirty-eight varieties were under study of which six were selected for comparative trial. Seven varieties were carried forward for further study and the rest were rejected. The results of the manurial trials are according to those obtained in previous years. Two hundred pounds nitrogen as cake and ammonium sulphate with potash and phosphates have given the highest tonnage. The application of the manures in pits round the stools gave 8 per cent increased yield over the local method. The crop in the ratoon area suffered most from diseases when compared to the planted crop. In the loamy garden soils of Palur, the difference in favour of the planted crop was as much as 17.81 tons. Under cost of cultivation there was a saving of nearly Rs. 65, but the loss in tonnage was greater. Ratoon crop matures early. In the irrigation experiment it was again found that Co. 213 is the best drought register and Co. 285 and Co. 243 were equally good for restricted irrigation. However P.O.J. 2878 did not do well under these conditions. The monthly planting trials show that March and April are the most suitable season for planting canes. Planting after May was not found desirable. One thousand and two hundred pounds of activated carbon was made for demonstrations of cream jaggery making. Cream jaggery and sugar making demonstrations were held on the farm.

Other crops.—Cumbu grown in 5.40 acres gave an acre yield of 1,219 lb. Kakijonna, ragi and tenai yielded 1,192 lb., 1,252 lb. and 1,412 lb. per acre.

A.H. 25 groundnut under irrigation yielded 2,945 lb. per acre. Gingelly and castor yields were 269 and 546 lb. per acre, respectively. The average yield of cambodia cotton was 671 lb. per acre. Fodder crops were sown in 4 acres which yielded fairly well. Teosinte gave 34,840 lb. per acre while fodder cholam yielded 24,600 lb. per acre. The yield of the plantains was fair. The fruit trees are coming up well.

The scheme of economic rotation inaugurated by the Director of Agriculture in 1930 was concluded. Due to low prevailing prices, the average net profit per acre was only Rs. 77-0-4.

Side lines of farming.—Poultry farming was continued; on an average 158 birds were maintained. The details of eggs and chicks obtained and disposed off are noted below—

Total eggs	2,701
Eggs sold for hatching	307
Eggs kept for hatching on the farm	752

Three hundred and seven chicks were obtained and 74 birds were sold for breeding purposes. One light sussex hen laid 155 eggs in a year while one white leghorn laid 117 eggs in 266 days.

Bee keeping work was continued and 6 lb. of honey was extracted. Two live colonies were sold.

Seed distribution.—The following quantities were distributed from the station:—

Paddy seeds	28,802 lb.
Groundnut seeds	3,413 "
Ragi seeds	1,248 "
Teosinte	166 "
Cumbu	218 "
Sugarcane setts	192,690 setts.
Grass slips	35,250

Exhibitions.—Exhibits of farm products were sent to six exhibitions.

Practical training in Agriculture.—The Manual Training Instructor of the Government Training School, Cuddalore was trained in poultry farming and bee keeping for two months. Ten agricultural labourers were also given training.

Implements.—The Kalyan power decorticator and the Hindustan Persian wheel that were received from the firms were successfully demonstrated and were sold to two ryots.

Cattle.—Three old pairs were sold and four country animals were purchased in the local shandy. Montgomery bull was transferred for work. On an average 6.2 pairs were maintained and the cost of maintenance of a pair comes to Rs. 159.26. The two heifers and cow No. 136 calved during the year and are in milk. The farm breeding bull performed ten services.

Buildings.—The following new works and extensions to the existing buildings were completed:—

	RS.	A.	P.
Fencing the southern boundary of the farm	648	5	11
Construction of a tiled shed for jaggery, etc.	446	12	0
Improvements and repairs to other buildings	744	12	2
Total	1,839	14	1

Visitors.—There were 340 visitors to the station.

Finance.—The expenditure amounted to Rs. 10,048-9-7 and the receipts were Rs. 4,569-14-6 excluding the cost of seeds and other materials transferred to departmental officers.

AGRICULTURAL SCHOOL FARM, KALASTI.

Season.—There was a total rainfall of 45.22 inches against the five years' average of 39.91 inches. However the distribution was not a fair one as the summer rains were not at all satisfactory. However the rainfall in the south-west and north-east monsoons were above normal.

Wetlands—(a) Paddy.—Kesari paddy was grown in 4.25 acres in January of the previous year and gave an average yield of 2,480 lb. grain and 2,564 lb. straw per acre which is the highest

yield so far obtained on the farm. Vadan samba, vadan samba selections, G.E.B. 24, A.E.B. 178, Sukudas and Banku paddy varieties were grown in 4.25 acres and the yields are noted below :—

	LB.
Vadan samba	2,600
G.E.B. 24	1,940
Sukudas and A.E.B. 178	1,851
Banku paddy	1,300
Vadan samba selections	2,000

Co. 5, Co. 2 and Molagulukulu varieties were grown in two acres and an average yield of 1,452 lb. of grain was obtained. The damage from borer was considerable.

Dry lands—Groundnuts.—A.H. 45 gave an acre yield of 645 lb. while A.H. 25—1,058 lb. of pods. A.H. 45 was damaged badly by grass-hoppers and monkeys. Blackgram raised in three acres gave an average acre yield of 240 lb.

Garden lands—Sugarcane.—The varieties grown were noted in the last year's report. One thousand eight hundred and three pounds of jaggery per acre was obtained from those canes. Harvest of the current year's crop has not yet been completed. However the results obtained so far show that one acre in fields 18 and 24 yielded 4,024 lb. of jaggery.

Gingelly (70 cents).—The crop gave a fairly good yield of 550 lb. of seed per acre.

Ragi.—It was grown in 50 cents and an acre yield of 1,720 lb. of grain was obtained.

Plantains and vegetables were also raised in small areas. Teosinte and sunnhemp were grown and gave an acre yield of 4,000 and 7,500 lb., respectively, were obtained and used for fodder.

Livestock.—The number of work animals remained the same as in last year. They had heavy work. Three calves were sold for Rs. 60. A breeding bull is being maintained and it did 14 services.

Poultry.—The poultry that survived the epidemic and heavy mortality maintained good health during the year. There is some demand for Rhode Island Red in the tract.

New works.—A cart-stand for Rs. 90 and cement irrigation channel also at Rs. 90 were the two new works carried out during the year.

Finance.—The receipts of the farm were Rs. 981-2-7 as against Rs. 562-10-10 of the previous year. In addition to this some stock of paddy and jaggery was left unsold at the end of the year. The expenditure for the year was Rs. 2,849-7-3 against Rs. 2,439-13-6 of the previous year.

S. U. KHAN,
Deputy Director of Agriculture, IV Circle.

(6)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, V CIRCLE, TRICHINOPOLY, FOR THE YEAR 1935-36.

I.—CHARGE.

I was in charge of the circle throughout the year.

II.—DEMONSTRATION.

1. *Season.*—The hot weather rains were slightly below normal in both the districts—Tanjore and Trichinopoly. Although regular monsoon began only during the 3rd week of June, water was let in the Cauvery on the 2nd week itself. This is evidently due to the existence of the Mettur Dam. Freshes in the river Cauvery were received by the middle of July but due to a slip in the Mettur Dam the supply of water was unsteady for some time. This necessitated the planting of kuruvai and raising of samba nurseries in the eastern portions of the delta, late by over a fortnight. Rains in September and October were not only below average but ill-distributed which adversely affected the dry crops and paddy under tanks. Attack of insects on crops increased. Rains in November were above average, and precipitated in a few days attended with a strong cyclonic wind which caused not a little damage to the standing crops and fruit trees in the southern portion of the Tanjore delta. December rains were at a time when the main samba was in the flowering stage, and a certain amount of unsettling was the result. These untimely and unusual rains caused attack of insects on crops and blast on Korangu samba paddy. The rains in January-February interfered with the harvest of paddy. The unusual good rains in March were beneficial for the green manure crops and facilitated preparation of lands for sowing and planting and dry kuruvai nurseries.

In short the year is one of average rainfall but ill-distributed—there were no rains when required and downpours when not required. Both dry and wet crops were not much benefitted and the yields in most cases were below normal.

2. *Crops*—(a) *Cereals*—(i) *Cumbu.*—Cumbu is one of the important crops in the dry tracts of the Trichinopoly district. Tinjivelly cumbu does not fare well all over. In its place trials were conducted with Bellary and Punjab cumbu with favourable results. These trials will be continued.

(ii) *Cholam.*—Of the five strains, A.S. 367, 1543, 1575, 118 and 809 tried last year under irrigated conditions, the first two gave satisfactory results. This year trials were confined to the first three strains in Karur and Kulittalai taluks. If results prove satisfactory, they will be multiplied and distributed.

(iii) *Ragi*.—E.C. 593 ragi has been introduced in 12 taluks and it has done well in all the places and 680 lb. of seeds sufficient to sow 112 acres have been reserved by ryots. A strain of the same duration as local variety will find favour and spread rapidly.

(iv) *Paddy*.—Paddy is the main crop in the wet area. Due to fall in prices its cultivation is not so remunerative as it was some years ago. With all that, it would not be replaced by other remunerative crops on a large scale due to various causes limiting the cultivation of other crops. Hence in addition to advocating growing of money crops as sugarcane, turmeric, plantain, etc., in rotation with paddy wherever conditions permit, every effort is made to increase the outturn of paddy with the minimum expenditure. To that end ryots are advised to resort to improved systems of cultivation.

Improvements in paddy cultivation and use of strains of paddy.—We have strains for almost all the local varieties. The strains are very popular and in great demand. The seed supply from the Agricultural Research Station, Aduturai, is very small and it is used as a nucleus for multiplication and distribution. Seed farms for the multiplication of paddy seeds are run by Ryots Seedsmen, Co-operative Agricultural Societies and Agricultural Associations, roguing being done by the Agricultural Demonstrators. By this method the spread of strain is very rapid.

During the year 78,457 lb. of paddy seeds were sold by the department and 779,705 lb. by Ryots Seedsmen, Co-operative Agricultural Societies, etc., within the knowledge of the department. The approximate area cropped with our strains is 441,641 acres as far as could be ascertained by the Agricultural Demonstrators.

Katta samba strain released three years ago is becoming popular and occupied an area of 6,110 acres. Even during this year of severe blast, the strain has maintained its superiority.

(b) *Planting with thin sown seedlings of paddy*.—The area that was planted economically for the first time during the current year is 18,258 acres, the seed-rate varying from 21 to 42 lb. per acre. The total area under this improvement in the circle is 688,533 acres.

In addition to the above improvements the following are suggested :—

(1) Raising of suitable green manure crops and ploughing them in.

(2) Application of phosphatic manures in conjunction with green manure.

(3) Use of improved light mould board iron ploughs.

3. (a) *Attempts at the introduction of money crops in the Tanjore delta*.—The scope for raising commercial crops, though limited, in the Tanjore delta, there were 320 acres under sugarcane during the year as against 114 acres of last year. During this year, about 320 tons of canes were purchased by Messrs. Parry & Co., from Mayavaram and Shiyali taluks. This will solve the problem of milling in a way.

Another paying crop is plantain. It has been introduced in 35 acres this year.

4. *Fibre crops*—(a) *Cotton*.—Its cultivation is restricted to Trichinopoly district. Distribution of improved strains of cambodia cotton and karunganni cotton seeds and the line sowing of cambodia are the main items of work. Fifty-nine thousand and sixty-nine pounds of Co. 2 cambodia and 3,270 lb. of C. 7 karunganni seeds were distributed departmentally. Six thousand and ninety acres were put under Co. 2 cambodia and 695 acres under C. 7 karunganni during the year. The area sown in lines is 3,219 acres. At the instance of the Cotton Specialist K. 546 (Karunganni) and H. 1 Uppam were tried in Udayarpalaiyam and Perambalur taluks. The pickings continue and if results prove favourable the trials will be continued.

(b) *Fodder crops*.—Ryots are advised to grow small areas under fodder cholam, raise guinea and elephant grasses in their gardens to serve as green fodder. Five thousand three hundred and nineteen pounds of Periamanjol cholam, 223 lb. of maize seeds and 8,000 slips of guinea and elephant grass were distributed. Before introducing in the district the practice of growing sunnhemp (for fodder) after the paddy crop, trials were made both at the Agricultural Research Stations, Aduturai and Pattukkottai to sow sunnhemp in January. In both the places the crops were greatly damaged by caterpillars.

(c) *Fruits*.—Coconut, plantain, mango and citrons are the chief fruit trees.

(i) *Coconuts*.—Ryots are advised to intercultivate their topes, adopt proper spacing in new plantations, raise green manure crops and apply the same with phosphatic manures. 520 acres were intertilled and 64 acres were manured.

The demand for departmental seednuts and seedlings is ever on the increase. But as the supply is very much restricted arrangements were made to augment the supply from Adirampatnam side. Seven hundred seednuts from Kasaragod and 926 seednuts and seedlings from Adirampatnam were distributed to the ryots.

(ii) *Plantains*.—Application of phosphates along with local manure has been found to increase the yield and improve the size of fruits; 1,063 acres were thus manured.

The cultivation of other fruit trees also is being encouraged. Advice in regard to selection, planting, pruning, manuring and controlling of pests is continued to be given. A leading ryot at

Kumbakonam has grafted 1,200 mango plants and disposed of 800. This is worthy of emulation by others. Besides these, graft plants of 2,531 mango, 384 citrons, 247 pomegranates, 46 sapotas, 100 pineapple suckers, 15 guavas, 27 jack and 4 grapes were distributed by various other nursery-men.

(d) *Oil seeds*.—Further trials of H.G. 1 and A.H. 25 ground-nuts with the local conclusively proved the superiority of the strains. The department distributed 200 and 320 lb. of A.H. 25 and H.G. 1 respectively. The ryots have now reserved 3,240 lb. for seed purposes. The demand for the strains is on the increase.

(e) *Sugarcane*.—With the fall in the price of paddy, extension of cane cultivation has become an economic necessity. The spread of the improved varieties of thick canes, however, is far below our expectation, due to the fact that they are not only of long duration but also require plenty of water and manures. They do not withstand drought or water stagnation. With the introduction of Coimbatore thin canes like Co. 281, Co. 285, Co. 213, Co. 352, Co. 353, etc., the spread has been more rapid—the ryots of Tanjore district also taking to it kindly. These varieties are of short duration requiring less cultivation expenses. They are capable of withstanding drought and water logging. The area under improved canes has now risen to 2,382 acres of which 118 acres are under Coimbatore thin canes.

Planting canes in trenches, manuring the crop economically and better methods of preparation of jaggery are also taught to the ryots. As a result of our propaganda, ryots purchased two power crushers, six bullock power mills and three jaggery pans. Thirty-nine demonstrations of better methods of jaggery manufacture with improved furnaces were conducted. Preparation of cream jaggery was demonstrated in the exhibition grounds at Srirangam (Trichinopoly taluk) and at three other places.

(f) *Vegetable crops*.—The cultivation of tomatoes and other vegetables as brinjal, beans, radish, carrots, etc., is recommended by the Agricultural Demonstrators. The response in respect of cultivation of tomatoes is very encouraging.

Four hundred and forty-four one anna packets of tomato and 20 lb. of Soya bean seeds and 47½ oz. of other vegetable seeds got from the Agricultural Research Station, Aduturai, were distributed to the ryots.

(g) *Spices and narcotics*.—*Dhulia onion*.—Ryots realize the profits that accrue by growing the crop and the demand for the seed is on the increase. During the year 32½ lb. of Dhulia onion seed sufficient to plant 8 acres were supplied to the ryots.

5. *Implements*.—The necessity for using the more efficient iron ploughs is emphasized and demonstrated; so that the improved implements may be in the easy reach of poor ryots. Takkavi loans are granted freely. This system is finding favour among ryots.

As a result of 571 demonstrations with iron ploughs and 189 demonstrations with other labour saving implements, 346 ploughs of different types, 504 spare parts and 160 mhote wheels were distributed.

In addition, the following were obtained for the ryots:—

Power crushers	2
Cane mills	6
Improved water lift (Rahat)	1

One Doctor Rajan has purchased a tractor and a cultivator.

6. *Manures and manuring*.—The output of local manure, which consists of cattle dung, house sweepings, tank silt, etc., being very limited and insufficient for even one-fourth of the paddy area, seed-beds and double-crop lands only receive any manure. Usually single-crop lands receive no manure. Though ryots are well aware of the necessity of improving and increasing the local output of manure they do not adequately respond to our advice on the subject. Due to intensive propaganda on the necessity of conserving cattle manure under improved systems, the following were constructed during the year:—

Manure pits	373
Loose box	11
Dry earth sheds	321
Byre system	25
Compost pits	78
Indore process of composting	4

Five municipalities were approached for the adoption of the Indore Process of Utilization of Habitation Wastes. Karur Municipality alone has taken to it; the others could not take it up either for want of funds or suitable locality except Tiruvarur Municipality, which has promised to take it up soon.

The system of growing green manure crops like kolinji, indigo, daincha, sunnhemp and pillipesara is increasing. Forty-eight thousand nine hundred and ninety pounds of green manure seeds were distributed departmentally and 298,273 lb. by private agencies. The area under green manure was 41,252 acres. It is worth mentioning here that red, green and black gram crops are raised for green manure purposes in this circle. The requirements of kolinji and sunnhemp of other circles are met by this circle as usual.

The use of phosphates like bone-meal, bone sinews, etc., as manure to wet and garden lands, though popular the low prices of produce preclude such investments. Even with such limitation,

the department has been able to induce ryots to purchase 144,121 lb. of bone-meal and 41,840 lb. of bone sinews.

7. *Pest Act*—(i) *Groundnut*.—The Pest Act in respect of hairy caterpillar "*Amsacta Albistriga*" was in force during this year also in the three firkas of Udayarpalaiyam taluk of Trichinopoly district. A campaign was arranged to combat this pest. There were altogether half a dozen emergences during the season. The ryots have well understood the benefits of the Act and followed the departmental advice. The rains were normal and the crop was fair in spite of the pest.

(ii) *Cambodia cotton*.—The Act was in force throughout the Trichinopoly district. Eradication was complete only in the three taluks of Trichinopoly, Karur and Udayarpalaiyam before the prescribed date and the special attention of the Revenue Officers had to be drawn to take steps for removal. A very large area in the Marungapuri zamin and in the villages bordering the Pudukkottah State in the Kulittalai taluk stood un-eradicated for over a month after the prescribed date.

Except in one solitary instance in Kulittalai taluk, the penal provisions of the Act were not applied anywhere. Steps are being taken for the introduction of the Pest Act in the Pudukkottah State also in consultation with the State authorities.

(iii) *Water Hyacinth*.—The Act in respect of removal of water hyacinth, which was confined to Tanjore district was extended to Trichinopoly district also this year. Ryots are advised to remove the weed, which will otherwise interfere with the water courses and make useful composts for application to their fields as manure.

8. *Pests and diseases on crops*.—In addition to the Mycology demonstrator, an Entomology Assistant was posted to this circle with headquarters at Aduturai. The Assistant in Entomology, in addition to attending to the hairy caterpillar campaign visited almost all the taluks of the circle suggesting or carrying out remedial measures for the pests on important crops. At Aduturai he was utilized in pest control work and in the study of life history of some insects.

The Mycology demonstrator attended to demonstrations of Atlas "Tree Killer" and to spraying for the diseases attacking fruit trees like guavas, mango, citron, etc. He attended to the pruning and spraying of grape vines for mildew attack in five taluks. During his stay at Aduturai, his services were utilized in the selection of sugarcane setts, spraying for crop diseases and examination of specimens received and collected.

9. *Trial plots*.—Ninety-nine trial plots were organized in the circle for groundnut, paddy, cotton, ragi and cumbu strains against local varieties.

From the results of the various trial plots, the yield of strains and improved varieties was favourable in most cases, as may be evident from the statement below :

Results of the Trial plots (1935-36).

Item and details of trials.	Number of trials.	Results of trials.
(a) <i>Paddy</i> .		
1 Chitrakali versus local kuruvai.	3	The strain gives 17 per cent increase over the local and is 10 days longer in duration.
2 Chitrakali udu versus local udu.	1	Strain gives 4 per cent increase.
3 Adt. 9 versus local kuruvai.	3	Adt. 9 strain gives 14 per cent increase on an average.
4 Adt. 4 versus local kuruvai.	2	Adt. 4 gives 9 per cent increased yield.
5 Adt. 11 strain versus AEB. 65.	6	Adt. 11 gives on the average 5 per cent increased yield over AEB. 65.
6 Adt. 8 versus Adt. 2 strain.	2	Adt. 8 gives 14 per cent increased yield over Adt. 2.
7 Sanna samba strains 693 & 706 versus the standard.	3	Strain 693 gives 15 per cent increase and 706, 8 per cent increase over the standard.
8 Adt. 3 versus local sarapali.	3	Adt. 3 strain gives 10 per cent increase.
9 Adt. 10 strain versus local katta samba.	1	Adt. 10 gives 10 per cent increase over the local.
10 Kavungin boothalai versus local.	1	Boothalai gives 17 per cent lower yield.
11 Strains 10783 & 10905 versus Co. 3.	2	Strain 10783 gives 5 per cent increase and strain 10905, 7 per cent increase over Co. 3.
(b) <i>Groundnuts</i> .		
12 A.H. 25 & A.H. 45 strains versus local.	10	A.H. 25 gives 18 per cent increase and A.H. 45 gives 10 per cent increase over the local.
13 E.C. 593 ragi strain versus local.	2	Strain gives 15 per cent increased yield.
14 Punjab cumbu versus local variety.	2	Punjab cumbu gives 7 per cent increased yield.
15 Red gram varieties 263/595, 263/597 and Kurnool versus local.	3	263/595 gives 4 per cent increase, while 263/597, 15 per cent increase. (263/597—early type is preferred).

10. *Demonstration plots*.—Under the new system each demonstrator has to tackle eight centres of work with a group of four or five villages adjoining each centre. The minimum of 50 demonstration and trial plots was kept in view. Seven hundred and sixty-seven demonstration and trial plots intended to show the superiority of varietal, cultural and manurial treatments in respect of the different crops were laid.

11. *Joint work with the Co-operative Department*.—Ten Co-operative Agricultural Societies are in existence in the circle. They run demonstration plots, seed farms and act as agents to

secure seeds and manure requirements. It is worthy of interest that the Kumbakonam Co-operative Demonstration Society and the Lalgudi Sivagnanam Co-operative Agricultural Society, Lalgudi, have done exemplary work. They have distributed 21,815 lb. of paddy seeds and 26,893 lb. of green manure seeds. The loan section of the Lalgudi Society has issued a loan of Rs. 15,402 on the security of 7,855 bags of paddy. 101,829 lb. of bone-meal have been distributed through the agency of these societies besides other manures.

12. *Agricultural Associations.*—Inclusive of the two district associations in Trichinopoly and Tanjore, there are 25 Agricultural Associations. The village and taluk associations do not interest themselves in the work to the desired extent. The District Agricultural Association at Trichinopoly conducted the Agricultural and Industrial Exhibition at Srirangam on an elaborate scale.

The Tanjore Delta Mirasdars' Association at Mayavaram issues a journal entitled *Mirasdar*, and also a Weekly Marketing Intelligence.

13. *Agricultural exhibitions and shows.*—Fifteen exhibitions were held during the year. As usual a large-scale exhibition was staged during the Vaikunta Ekadasi festival at Srirangam. It was opened by J. B. Brown, Esq., I.C.S., District Collector, Trichinopoly, on 2nd January 1936 and was run till 12th. A model farm house with necessary equipment of improved cattle-shed, manure pit, dairy, poultry and apiary with an orchard of properly spaced fruit trees and demonstrations connected with cultivation of sugarcane and manufacture of jaggery was put up. This attracted the visitors very much. The use of electric energy for agricultural purposes was kindly demonstrated by the Trichinopoly-Srirangam Electric Supply Corporation, Ltd. The department participated in the Health Week Exhibitions held in Srirangam and Mayavaram.

14. *Lectures and conferences.*—The Agricultural Demonstrators attended the ryots' conferences held during jancabandi in eleven taluks and talked to the ryots on agricultural improvements.

15. *Improvement of livestock.*—There are 16 breeding bulls of approved type of which 12 are under the premium scheme. This excludes a good number of stud bulls maintained by individual ryots and herdsmen.

16. *Poultry.*—Five hundred and forty-six eggs for hatching and 75 chicks and adult birds of improved breeds of fowls were distributed to the ryots from the Agricultural Research Stations, Aduturai and Hosur. The ryots interest themselves in poultry farming and take to it kindly as a side line of agriculture to augment their income.

17. *Apiculture.*—A lively interest has been created among the ryots to take up bee-keeping; there are now 79 bee colonies working. So far 100 lb. of honey have been extracted from 12 hives within our knowledge.

18. *Loans.*—Takavi loans for mass distribution of improved ploughs and implements were mostly confined to the Trichinopoly district. The entire allotment of Rs. 2,500 was spent up. Efforts are made to push on the distribution of mould board ploughs in the Cauvery-Mettur Project area where there is much scope for the introduction of Cooper Nos. 25 and 11 ploughs, with the help of loans. Under the loan system the following implements have been distributed:—

Ploughs	198
H.M. Guntaka	2
Mhote wheels	141
Spare parts for ploughs	68
Rahat water lift	1
Cultivator	1

19. *Motor van.*—The exhibition motor van, III unit, continues to tour in this circle from 8th January 1936 and has visited 48 important villages till 31st March 1936. The officers of the Veterinary and Health departments accompanied the van wherever possible. Besides explaining the exhibits to the ryots, 44 magic-lantern lectures were delivered.

20. *Sale of publications.*—In addition to the free distribution of leaflets, 903 villager's calendars and 124 bulletins were sold.

III.—AGRICULTURAL RESEARCH STATION, ADUTURAI.

1. *Charge.*—Mr. M. Anandan held charge of the station throughout the year except for a day on 3rd January 1936 when he was on leave on average pay in continuation of Christmas and New Year holidays. I was in additional charge of the station during that period.

2. *Season.*—The total rainfall was above the average, but the number of rainy days fell short of the normal. The distribution of rains was not quite ideal either for agricultural operations or for growing crops.

3. *Crops—Paddy.*—This station has so far released 11 strains of paddy suitable for this circle. The strains are very popular and are replacing the local varieties. The station has distributed 75,235 lb. of seed during the year and has reserved 70,000 lb. for the coming season.

Selection work.—(a) A mutant strain 6119 from Adt. 4 gave 29.7 per cent increase over Adt. 4, which itself is a 10 per cent better yielder than the bulk. Trial of this strain in the districts will be arranged in the coming season. Single-plant selections from local, which are of special importance for the Cauvery-Mettur Project area are being done. Strains of Korangu samba *versus* GEB. 24 cross progenies which were found high resistant to 'Piricularia' disease will be issued for district trials.

(b) *Commercial crops*.—Though the main work of the station still continues to be the improvement and evolution of paddy strains, definite experiments are now being made to ascertain the possibility of growing commercial crops like sugarcane, plantain and groundnut in rotation with paddy. The results are quite encouraging and these crops are grown permanently. The sugarcane crop on the farm occupied an area of 1.71 acres and the ratoon 0.95 acre. Ninety-five thousand nine hundred and thirty setts for planting were distributed from the station crop this year.

(c) *Green manure—Sunn-hemp*.—Rising a crop of sunn-hemp in June after the receipt of water in channels having proved successful, growing of this crop is advocated to the ryots.

4. *Livestock*.—One Kangayam and two Ongole bulls were at stud during the year and there were five cows in milk at the beginning of the year.

5. *Poultry*.—The year opened with a flock of 110 birds. Four thousand and thirty-three eggs were sold for table, 174 used for hatch on the station and 446 issued for hatch to outsiders. The crossing of country birds with pure breed cocks was continued systematically.

6. *Apiculture*.—Seventeen hives are at work.

IV.—AGRICULTURAL RESEARCH STATION, PATTUKKOTTAI.

1. The station is situated 6 furlongs north of the Pattukkottai Railway Station along the Muthupet road in the village of Nadiambalpuram adjacent to Pattukkottai Town.

2. *Object*.—The farm was started to meet the needs of the new Cauvery-Mettur Project area and to study the possibilities of growing commercial crops like sugarcane, plantain, turmeric, etc., and to find out better yielding strains of paddy suitable to the tract.

3. *Season*.—The rainfall though slightly below normal was not well distributed. A rainfall of 10.50 inches during the 3rd of December did damage to the paddy crops and delayed the harvest of early paddy varieties. The season was not quite favourable for paddy and groundnut, the major crops of the station.

4. *Soil*.—The soil is light and porous and the absence of nitrogen and phosphoric acid is very marked. The addition of organic matter in large quantities will improve the soil.

5. *Crops*.—This is the first year of cropping on the station. Owing to the hard nature of the soil regular levelling work had to be done only after the receipt of water in the channel. This has considerably delayed the planting of paddy and caused changes in the cropping scheme.

(a) *Paddy—Kuruvai (first crop)*.—Strains Adt. 3, 4 and 9 were grown in 4.25 acres. Adt. 9 was very badly damaged by

cyclone in November and gave an acre yield of 972 lb. only while Adt. 3 and 4 gave an average acre yield of 1,922 lb. and 1,520 lb., respectively.

Thaladi or second crop.—Acres 3.75 were cultivated with different varieties to see which will suit best. Co. 2, AEB. 65 and GEB. 24 have fared well. Co. 2 gave 1,760 lb. per acre.

Single-crop samba.—Adt. 2, 8, 10, 11, AEB. 65, Co. 6, and GEB. 24 were grown in 3.10 acres. AEB. 65, Co. 6, Adt. 2 and GEB. 24 have given good results.

(b) *Groundnut*.—Experiments to see whether a crop of groundnut followed by a crop of paddy in double-crop land is better than two crops of paddy were conducted. The difference was not appreciable and the trial will be continued. Gudiyatham bunch as an irrigated first crop in wet land gave an acre yield of 1,000 lb.

(c) *Sugarcane*.—Sugarcane was grown in 2.25 acres, the varieties being Co. 213, 281, 285, 352 and 353. The stand of the crop was fairly good.

(d) Other crops like plantain, turmeric, tobacco, Bellary onion and cotton are cultivated. Fodder chulam was raised in 1.60 acres with an acre yield of 11,589 lb. for irrigated crop and 3,244 lb. for dry crop. With this the scarcity for fodder was tided over.

Green manure crops have been raised in all possible fields.

6. *Buildings*.—Most of the building works as quarters for Farm Manager, Assistant Farm Manager, office and store, construction of wells and other sundry works were taken up and completed during the year at a cost of Rs. 10,122-1-1.

N. S. KULANDAISWAMI PILLAI,
Deputy Director of Agriculture, V Circle, Trichinopoly.

(7)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, VI CIRCLE, MADURA, FOR 1935-36.

I.—CHARGE.

There were many changes in the personnel of the Circle Officer and the Assistant Directors of Agriculture of this circle during the year as under :—

M.R.Ry. K. Unnikrishna Menon Avargal was the Deputy Director from 1st April 1935 to 4th April 1935. M.R.Ry. C. R. Srinivasa Ayyangar Avargal, Deputy Director from 5th April 1935 to 30th July 1935. M.R.Ry. C. Ramaswami Nayudu Garu, Deputy Director from 31st July 1935 to 15th August 1935. Nawabzada Saadat-ul-lah Khan, Esq., Deputy Director from 16th August 1935 to 23rd December 1935. M.R.Ry. R. N. K. Sundaram Avargal (additional charge), Deputy Director, from 24th December 1935 to 2nd January 1936.

I took charge of the circle on 3rd January 1936 and continued till the end of the year.

II.—AGRICULTURAL EDUCATION.

The Madura District Board Agricultural Middle School at Usilampatti worked satisfactorily as in previous years. With the reopening of the school after the vacation, 11 students were promoted from the Junior to the Senior class. Of the 19 new admissions during the year, 13 were taken to the Senior class as they had the required general educational qualifications, and the other six joined the Junior class. Thus the total strength of the school was 30 throughout the year. It is gratifying to note that unlike last year no student left the school during the year. The Kallar boys were receiving boarding grant from the Labour Department while the District Board met the boarding charges of the non-Kallar boys. The Senior batch was taken on short agricultural excursion to Periyakulam taluk and the Koilpatti Agricultural Research Station to study the agricultural practices and improvements done by the department on the station and the ryots' lands. Special lectures were delivered on cattle and their diseases by the Veterinary Assistant Surgeon, on crop pests and diseases by the Entomological and Mycological demonstrators and on Rural Sanitation and Co-operation by the officers of the concerned departments. The final examination in Agriculture and Botany was conducted by the Assistant Director of Agriculture, Madura. The school farm afforded ample facilities for the boys for practical work.

2. An Industrial School was started in July 1935 by the Ramnad District Board at Muthanendal with 27 boys on the rolls. The course extends over two years and education is imparted in Agriculture and subsidiary industry like weaving, poultry, bee-keeping and rural reconstruction. A Kangayam bull is lent to the school by the department and a few birds of improved poultry breed and a pair of Berkshire piglings have been recently secured. The progress of the institution is to be watched.

3. Agriculture was introduced during the year as an optional subject in the S.S.L.C. curriculam in the Board High Schools at Koilpatti, Tenkasi and Rajapalaiyam. A scheme of work, syllabus and a budget for recurring and non-recurring expenditure, etc., were prepared for them. Each school has a B.Sc. (Ag.) as Agricultural Instructor. All possible help was rendered by the local Agricultural Demonstrators to the schools.

III.—DEMONSTRATION.

1. *Season*.—The season during the year under report is in no way better than that of last year. The total rainfall of Madura district was defective by 7.32 inches. The south-west monsoon was late in some parts and proved a failure in Tinnevely district.

The total rainfall recorded was far above the average in many cases but the distribution was bad. The heavy and unusual rain in March was beneficial to the cotton crop whose season picking was poor and a good summer picking is expected. Rainfed paddy was benefited but gingelly suffered. Due to droughty weather for about six months followed by incessant downpour in October and again by a long spell of dry weather up to March, the yields of wet and dry crops were below normal except cotton which may give a good summer picking. On the whole the season was bad for the agriculturist whose condition is far from satisfactory. Prices of commodities remained almost stationary.

2. *Crops*—(a) *Cereals*—*Paddy*—(i) *Varieties*.—As in previous years the introduction of high yielding paddy strains and their spread in large areas was continued during the year. G.E.B. 24, locally known as 'Toppi samba' has become very popular in the circle. In the Periyar tract it is largely grown as a first-crop and to a fair extent as a second-crop. A.E.B. 65 which is locally known as 'Arai samba' or 'Thangamani samba' is replacing the local Nellore samba and its progress is satisfactory. Co. 2 has become quite popular on account of its short duration and suitability for the first and second-crop seasons. Co. 8 selection of local 'Anaikomban' is much appreciated as giving better yield in the Tinnevely division. Other strains, Co. 1, Co. 3, Co. 5, Co. 8, Co. 9 and Adt. 3 are being tried and their performance will be closely watched.

(ii) *Seed distribution*.—To meet the growing demand of these high yielding varieties, seed farms on an area of 615.22 acres were arranged under GEB. 24, AEB. 65 and Co. 2. Presuming that the ryots would reserve half the produce for their own use, it is expected that about 615,000 lb. of seed would be available for distribution by the ryots to their neighbours to cover about 30,000 acres. The success of the spread of these strains depends on the ryots' selling their seed for sowing purposes. Wide publicity is being given in the villages regarding the availability of these seeds.

(iii) *Cultural improvement*.—The continued propaganda of the district staff on reduction in seed rate and economic planting had the desired effect. The seed rate has been reduced to 50% of that adopted by the ryots some years ago. The seed farms where the seed rate is much reduced, serve as a demonstration to ryots in the vicinity of such farms. The area planted economically is estimated to be 83,409 acres of which 784 acres are in Tinnevely division. The low figure in this division is largely due to the adverse season and comparatively poor response from many cultivators. Seed beds were partly affected by grasshoppers and many dried up in the Kar season owing to severe drought and non-receipt of monsoon rains. Broadcasting had to be resorted to in a few localities later.

(iv) *Green manuring*.—Growing of green manure crops was advocated in all places where possibilities existed and the ryots have come to understand the importance of incorporating large quantities of organic matter in their paddy fields. Kolinji has established itself fairly well in single-crop areas. Daincha has shown progress in parts. It serves not only as a green manure but also as a fodder for cattle during the summer months. Ryots have commenced in some cases to collect seed themselves but the prolonged drought checked the progress. Sunn-hemp and Indigo were also grown as a mixture with Daincha or horse-gram. A start was made to distribute Pillipesara. 29,172½ lb. of seeds (Daincha, Kolinji, Sunn-hemp, Indigo and Pillipesara) were distributed departmentally in addition to large quantity sold by private dealers.

(b) *Fibre—Cotton*.—The spread of high yielding varieties of better quality of cotton and drill sowing are the main items of improvements advocated by the department. Karunganni strains C. 7, A.10 and Cambodia Co. 2 are spreading rapidly. KPT. No. I was newly introduced during the year. Seed distribution was up to 189,395 lb. of Karunganni varieties as against 133,785 lb. during the previous year. 51,672½ lb. of Cambodia Co.2 seed were also distributed as against 68,635 lb. in the previous year. 1,276 acres of Karunganni and 199 acres of Cambodia seed farms were run during the year as against 1,336 acres and 175 acres, respectively, during 1934-35. The estimated area under the improved strains is 153,229 acres under dry cottons and 48,540 acres under Cambodia.

(c) *Fodders*.—The Madura Municipality devoted a large area of its Sewage Farm for Guinea grass. This is taken to the streets and sold. The Palni Devasthanam has 2 or 3 acres under this and Elephant grass, while there are about 10 acres under Guinea grass, Elephant grass, Kikiyu and Kolukkattai grass in the Dairy farm of the Sacred Hearts' College on the Kodaikanal Hills. 980 lb. of Periamanjil cholam, 3,455 lb. of Irungu cholam, 91 lb. of Teosinte, 121 lb. of Maize seeds and 140 lb. of Kolukkattai grass seeds were distributed for fodder purposes in addition to 2,347 Guinea grass slips.

(d) *Fruits*.—Due to the good impetus created in the cultivation of fruit trees, there was a keen demand for different kinds of fruit trees from all over the circle. Necessary advice was given to the cultivators regarding the best varieties to be grown and arrangements were made to get their requirements from the nurserymen. Gardens were visited and advice was given regarding clean cultivation, manuring, pruning, irrigation and spraying. Graft mangoes, oranges, grape-vines, limes, sapotas, pomegranates, figs, pineapples and guavas were obtained and distributed to the ryots. The total number so distributed was 6,276 fruit plants. In addition 538 coconuts were got and sold. An application was made to the North-West Frontier Province Department of Agriculture for the supply of cuttings of seedless pomegranates and grapes for introduction in the circle but rooted cuttings were reported to be not available. Rev. Howell of Donavur, Tinnevely district, maintains a 6-acre garden of Australian oranges and grape-vines.

The demand for vegetable seeds—both English and Indian—was met by procuring them from Messrs. P. Pocha & Sons., Poona, and seedsmen at Rajahmundry and Pakala.

(e) *Oil seeds*.—Spanish bunch variety of groundnut has found favour with the ryots due to its short duration and the ease in lifting. A.H. 25 Saloum groundnut was introduced for the first time and the yields are satisfactory in Madura district while it was not so in the Tinnevely division due to severe drought. The season for groundnut was not thoroughly satisfactory. In all 1,708 lb. of pods (Spanish bunch, Gudiyatham bunch and A.H. 25) were distributed.

(f) *Spices*.—Fifty pounds of Bellary onion seeds were distributed in a few places. In spite of the fact that ryots appreciate its qualities there seems to exist some difficulty in marketing this produce in some localities. Whether it will be possible to increase the area under this crop is to be decided in due course.

(g) *Sugar*.—The area under sugarcane is slowly increasing. The improved varieties—J. 247, Co. 213 and Fiji B—are popular with the ryots due to their better yield and finer quality of jaggery. Seed materials of thick cane varieties Co. 419, 417 and 421 as well as P.O.J. 2878 and B. 208, received from the Sugarcane Expert were tried and some of them have done well in

Periyar and non-Periyar areas of Madura district. A small quantity of E.K. 28 cane has been received in February 1936 and its germination is said to be good. In Tinnevely area the area under improved varieties is about 157.5 acres. The department is helping the ryots in supplying improved varieties of sugarcane and the manufacture of better quality jaggery. Demonstrations were conducted in Koilpatti and Avalnatham and it will be done at Srivaikuntam, Viravanallur and Kailasapuram. There were 17 cream jaggery demonstrations in the circle and the ryots appreciated them very much for the colour and the crisp nature of the cream jaggery. With the existing facilities, i.e., the availability of seed material within the circle, three improved mills recently purchased for the circle and proper propaganda, it is hoped that the area under sugarcane will be distinctly on the increase in the ensuing year. Messrs. N. S. T. Chari & Co., the sugar makers at Tackalai, Travancore, who are now handling palmyra jaggery are arranging to plant about 20 acres under Fiji B cane at Perumulinji in Nanguneri taluk.

3. *Implements*.—One thousand nine hundred and seventeen demonstrations were conducted during the year with the improved ploughs, mhote wheels, chaff cutter, cultivator, drills, guntakas, digging forks, sprayers, bund former, etc. As a result of the demonstrations the following sales were effected: Cane mill—1, R.E. mhote wheel—34, cultivator—4, ploughs—417, H.M. guntaka—4, R.E. guntaka—1, drills—22, sprayers—1, bund formers—8, wheel barrow—1, digging forks—15, chaff cutter—1, spare parts of ploughs, etc.—188. Persian wheel is becoming popular on account of its efficiency and simplicity in mechanism. During the year five such wheels were purchased by interested ryots. At present there are about 25 Persian wheels working in the circle.

4. *Manures*.—One of the items of work that engages the attention of the Demonstrators almost throughout the year is the right method of collection and preservation of cattle manure. Every cultivator is aware of the value of all waste material and though intelligent, he is not bent upon doing the thing in the right way. This point has been brought to his notice by the Demonstrators whenever they meet and as a result, better preservation of cattle manure was carried out in 1,174 pits, 111 dry earth sheds, 38 byres, and 181 compost heaps. The Indore process of utilization of habitation waste was followed by the Periyakulam Municipality to compost waste materials and street sweepings into valuable manure. To create a demand for its use 18 cartloads were given free for trial on paddy. The application was successful. The Dindigul Municipality did the same in a small scale but not others whose finance is said to be poor. Another trial of this was conducted at Tiruchendur. The application of the compost to paddy crop has increased the yield.

Groundnut, castor and neem cakes were applied in large quantities to paddy fields in Tinnevely district. It is learnt that over 1,285 tons of Sulphate of Ammonia were distributed by the Manure firms. Other Fertilizers like Niciphos, Super, paddy fertilizers, Ammophos distributed were about 725 tons.

5. *Pests and diseases*.—The Agricultural Demonstrators in Entomology and Mycology attended to calls for remedial measures against pests and diseases in the circle. Both of them attended to 93 reports. Pests and diseases treated on a large scale were Mildew on grape-vines, Hopper on mangoes, thrips on chillies, Epilactra on Brinjals, Aphis and scales on fruit trees. Pomegranate fruit borer was successfully tackled. The campaign against 'thrips' on chillies in Periyakulam taluk was continued in six demonstration plots and the control measures were very much appreciated by the ryots as the increase in yield in the treated plot was 22.65 % over the control. There is a keen demand for this but whatever is possible with the available staff and equipment is being done.

6. (a) *The Cotton Pest Act* was in force in Madura district. The taluks of Dindigul, Nilakottai and Melur were given extension of time by three weeks to pull out the Cambodia cotton crops, stipulating at the same time that sowings should be done only after the lapse of six weeks from the date of eradication. There were 446 prosecutions as against 251 in the previous year. 850.55 acres were left over without being uprooted on the due dates but they were eradicated on 18th September 1935 in the non-exempted areas and on 7th October 1935 in the exempted areas.

(b) *Cotton Control Act*.—The enforcement of this Act in a rigorous manner for the last two years had a good effect in reducing the area under the prohibited 'Pulichai' cotton. Due publicity of the provisions of the Act was made in time in the cotton centres. In Madura district only stray cases of cultivation of this cotton were found and by persuasion the plants were eradicated. Six men in Sankarankoil taluk alone who persisted in keeping the crop were recommended for prosecution and the judgment in these cases is awaited.

7. *Trial plots*.—Trials were conducted with Karunganni cotton strains 2529, 2681 and 1682 with 2622 (K.P.T. I), as control. So far the control has given better results. The yields are not fully in. Cambodia strain 1742-A, C.S. 1267, C.S. 920 and Co. 2 were tried in three places and No. 1742-A leads with 1,321 lb. to its credit while the rest yielded 1,209 lb., 1,179 lb., and 1,153 lb., respectively. Cholam strains A.S. 2095 and 367 fared better than local cholam in spite of the attack of earhead bug (*Calacoris augustatus*). Cumbu strain No. 5 is promising over local cumbu. A.H. 25 Saloun groundnuts gave an increased outturn over the local by 8–10 per cent. In two trials with Tenai, the yield of No. 544 is more than local by 107.5 lb. per acre. The results of

chillie trials are not yet to hand. Senthinayagam paddy strains 2,975, 2,976 and 10,440 have given higher yields than local by 8 to 11 per cent. The first two are suited to the Tambaraparni tract.

8. *Demonstration plots.*—Five hundred and eighty-five plots were laid out during the year as against 343 in the previous year. The main object with which these plots were started was to demonstrate (1) the superiority of the departmental strains of paddy, ragi, cumbu, sugarcane and groundnuts over the local varieties, (2) manurial improvements and (3) improved tillage. The yields of demonstration plots were 10 to 15 per cent over the control.

9. *Joint work with the co-operative societies.*—A new Loan and Sale Society has been just started at Rajapalayam and registered. Work is yet to begin. The Crop Loan and Sale Societies at Koilpatti and Tuticorin purchased 30,125 lb. of C. 7 cotton seeds and distributed them to the members. In Madura division, 10,000 lb. of Karunganni and 9,772 lb. of Co. 2 Cambodia cotton seeds were sold through the Co-operative and Cotton Sales Societies. Over 10,000 bags of paddy are reported to have passed through the Paddy Sales Society, Madura.

10. *Agricultural associations.*—None of the existing associations have done any work worth mentioning. Now and then some of the members of the associations write for advice and help for jaggery manufacture and the like. The Tinnevely "Buy Indian League" has not done anything except staging an annual show. The office-bearers will be interviewed and attempts made to infuse life in them.

11. *Exhibitions and Fairs.*—Five big and 26 small exhibitions were held during the year during Festivals and Health weeks. The exhibitions attracted large crowds. Ploughing demonstrations were conducted and lectures delivered on these occasions.

12. *Lectures.*—Ninety-four lectures with and without lantern were delivered during exhibitions, jamabandy camps and during the tour of the Motor Exhibition Vans.

13. *Motor Exhibition Van.*—The Exhibition Van Unit No. II toured in this circle for four months from June 1935 and visited 115 centres.

14. *Improvement of Livestock.*—Two bulls sent to the Koilpatti Agricultural Research Station for testing were returned to the Madura District Board. One is all right but the other Kangayam No. 87—being unsatisfactory for stud purposes, was advised to be castrated. There were 43 bulls (including 3 buffalo bulls) in the circle under departmental supervision of which 28 are under premia scheme. The District Board, Tinnevely, maintains 5 bulls purchased from Hosur and some of them are being included in the premia list. One Kangayam bull was given on loan to the District Board, Ramnad, and the Board has recently sanctioned the amount for its purchase. The Thottanuthu Panchayat Board

obtained a Kangayam bull on loan. These bulls were regularly inspected and advise given for their proper upkeep. Applications are still pending for the supply of more bulls of Kangayam, Scinde breeds and also buffaloes. Arrangements are in progress for their supply.

Poultry.—Thirty-six birds of improved breeds of fowls and 175 eggs were distributed during the year. The demand is on the increase and the needs of the public are in some cases catered by the American Mission at Tirumangalam, Manamadura, and Madura, who maintain a stock of White Leghorn, Rhode Island Red and Light Sussex breeds.

15. *Loans.*—Takavi loans have become popular. A sum of Rs. 2,015-12-0 was distributed on Takavi and special loans for purchase of ploughs and other implements including Rs. 600 for two Kirloskar Persian wheels. The number of applications disposed of was 180.

16. *Publications.*—Two thousand one hundred and seventy-four Villagers' Calendars, 138 bulletins and a dozen copies of Agricultural Facts and Figures were sold.

IV.—AGRICULTURAL RESEARCH STATION, KOILPATTI.

1. *Charge.*—Mr. R. Chockalingam Pillai was the Superintendent of the station till 23rd December 1935 when he proceeded on leave for four months in continuation of the Christmas holidays. Mr. C. V. Sessa Acharya was in additional charge during the holidays and Mr. C. Jagannatha Rao relieved him on 3rd January 1936. Mr. T. R. Narayanan continued to be the Physiological Botanist. A temporary Store clerk was sanctioned to the station during the year.

2. *Season.*—The season was again unusually dry and unfavourable to cotton. Millets and pulses suffered less.

3. *Crops.*—(a) Cotton occupied an area of 51.82 acres and yielded an average of 584 lb. per acre as against 560 lb. of last year. During this season from the main season picking KPT I has given the highest yield, i.e., 235 lb. of kapas per acre and A.-10 comes next with 204 lb. C.-7 and No. 546 have yielded 180 lb. and 187 lb. of kapas per acre respectively. It is expected that summer pickings will be much better than last year.

(b) *Cumbu* occupied 20.15 acres and yielded 400 lb. of grain in spite of grasshopper attack in the early stages. Selection No. 105 (Punjab variety) has beaten the (local variety) control by 18 per cent. The irrigated variety—Kottapuli cumbu—No. 409 and three local selections—Nos. 252, 261 and 292 have outyielded the control (local cumbu) by 28, 26, 17 and 17 per cent, respectively.

(c) *Cholam* cultivated on 23.41 acres for fodder yielded only 2,970 lb. straw per acre due to drought and incidence of grasshoppers. Selection No. 171 for fodder yielded 20 per cent over the local variety. Periamanjai cholam tried again during the year as a bulk crop harvested 6,700 lb. dry fodder and 235 lb. of grain per acre.

(d) *Ragi* strain E.C. 593 tried for the fourth time gave an yield of 55 per cent more than the local ragi. Its open panicle not being much in favour of the ryots strain E.C. 24 obtained from the Millets Specialist with incurved panicle was tried and it yielded 45 per cent more than the control (local ragi). This is also of short duration like E.C. 593. The difference in yield between the strains is not much and E.C. 24 is expected to satisfy the needs of the locality.

(e) *Sugarcane*.—Co. 417, Co. 419 and Co. 421 were added during the year to J. 247, Co. 213, P.O.J. 2878 and Vellai planted at the end of last year. The crops are not good in general. The first two look better than the rest.

4. *Other miscellaneous crops*.—Tenai S.I. 544 was poor. Tobacco varieties did not compare favourably with the local variety. Groundnuts did not fare well. Vegetables and *Solanum nigrum* (medicinal plant) continued to be satisfactory. *Teosinte* did better in red soil. Clovers, Berseem and Shaftal, lab lab, linseed, lentil and dry paddy were failures. The Mung type of greengram was satisfactory. A few suckers of plantains were introduced during the year. Grapevines yielded small harvests.

5. *Manurial trials*.—The direct application of manure (Ammonium sulphate) to cotton gave better yields. The economics of the application depend upon the prices of cotton, the cereals that succeed the cotton crop and the cost of manure. Indirect manuring of cotton also gave better yields than unmanured plots. The advocacy of the treatments from an economic point of view depends on the ruling prices of cereals cotton and cost of manures. The Indore technique of sanitary disposal of night soil and habitation waste has been attempted with a fair amount of success.

6. *Pests and diseases*.—Grasshopper (*Aclopus affinis*) caused considerable damage to cumbu and fodder cholam crops. The use of nets checked their ravages. 'Anthraenose' on grape-vines and 'Tikka' on groundnuts were successfully controlled.

7. *Livestock*.—The stock of animals consisted 29 at the end of the year. The three breeding bulls performed in all 187 services. A new step was taken by the transfer of six young Kargayam bulls to the station from Hosur for rearing and acclimatization prior to their sale in the locality for breeding purposes. The poultry continued to be white-leg horn birds. Six hens laid 513 eggs on the whole and 417 of them were sold.

8. *Ginnery*.—Twenty-eight thousand five hundred and ninety-one pounds of farm kapas and 90,644 lb. of seed farm kapas were ginned at the farm ginnery.

9. *Schemes and Research*.—The two schemes that are financed by the Indian Central Cotton Committee, i.e., the fodder cholam scheme and study of bud and boll shedding in cotton are continued during the year.

MADURA,
29th April 1936.

Y. G. KRISHNA RAO,
Deputy Director of Agriculture, VI Circle.

(8)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, VII CIRCLE, TELLICHERRY,
FOR THE YEAR 1935-36.

I.—CHARGE.

I continued to be in charge of the circle throughout the year unaided by an Assistant Director of Agriculture.

II.—DEMONSTRATION.

(i) Season.

2. *Season*.—The average of the rainfall recorded at the different rainfall recording stations in the two districts during the year was as follows :—

District.	Hot weather.	South-west monsoon.	North-east monsoon.	Total.
South Kanara	3.49	127.55	14.77	145.81
Malabar	5.77	74.42	17.2	97.4

The year was one of short rainfall like the previous year and the total fall in different periods was below normal.

The shortage of rainfall during hot weather—April–May—caused delay for the timely preparation of the land and sowing of crops. The plantation crops such as coconut and pepper suffered very much.

The south-west monsoon started about the middle of June with gentle and steady rains and during the month over 30 inches of rain were received. During this period cultivation operations progressed. The month of July recorded the heaviest rainfall amounting to 40 to 50 inches. The rainfall during the remaining two months—August and September—was not heavy but intermittent with occasional bright weather. The total rainfall and the distribution during the south-west monsoon period was fairly satisfactory and favourable to the growth of first crop of paddy.

The north-east monsoon rains started about the middle of October giving a good interval of bright weather between the two monsoons and facilitating the harvest of first crop of paddy. The total rainfall during the north-east monsoon period was very low and rains stopped suddenly about the middle of November. The early cessation of the north-east monsoon followed by a long dry period till the succeeding March caused water scarcity for the second crop of paddy and lowered the yields of paddy and dry-land crops.

On the whole, the year was one of short rainfall with unequal distribution during different periods and the seasonal factors

were favourable only to first crop of paddy and sugarcane and unfavourable to second crop paddy, coconut, pepper and dry-land crops.

(ii) Crops.

3. *Paddy*.—Propaganda work on paddy improvement continued as in previous years on the following lines, e.g., proper preparation of land, adequate manuring, introduction of better strains, raising of thin nurseries, proper planting of seedlings and selection of pure seed.

(a) *Pattambi strains*.—The previous year's results of the six Pattambi strains, PTB. 1 to PTB. 6 were encouraging and gave increased yields varying from 10 to 15 per cent over the locals. So there was great demand for seed of these strains during the current year. Two more strains PTB. 7 and PTB. 10 were released during the year. About 14,965 lb. of seed were supplied to ryots through the Demonstrators against 3,464 lb. in the previous year. In addition to this 13,637 lb. were sold to ryots directly from the Pattambi station. Most of the ryots who cultivated these strains during the previous year reserved the seeds for further extension and as far as information is available about 14,285 lb. were utilized for seed purpose. So the total quantity of seed of Pattambi strains used for sowing during the year was 42,887 lb. and the estimated area under the strains was 1,164 acres against 100 acres in the previous year. The usefulness of this station has just begun to show itself and is expected to increase in the near future. This was the second year of the release of the strains for general cultivation and the year's progress of their spread was very satisfactory.

(b) *Coimbatore strains*.—Among the Coimbatore strains GEB. 24 and Co. 3 are spreading in suitable localities in the circle. GEB. 24 is popular in Palghat, Walluvanad and Wynad taluks. Co. 3 is the next popular strain in the circle, especially in South Kanara district. During the year 18,980 lb. of fresh seed of the three strains GEB. 24, Co. 3 and Co. 5 were supplied from the research stations against 12,072 lb. in the previous year. In addition to this, 80,460 lb. of seed of different strains were arranged locally from ryot to ryot by the district staff. These strains are being cultivated by the ryots for the past several years on account of higher profit ranging from 10 to 20 rupees per acre. A rapid spread in the area was noticed during the year and as far as information is available, about 51,694 acres were under these strains against 32,247 acres estimated during the previous year.

(c) *Bulk seed*.—There was great demand for bulk seed of the local varieties such as Thavalakannan, Kurumkayama, Rajakayama, Thonnuran, Kattamodan, etc., produced at

the research stations. All available seed to the extent of 15,695 lb. were supplied to ryots through the district staff. As there was demand over and above this quantity, local arrangements were made to supply 51,200 lb. of seed from ryot to ryot. For the past several years, annually, large quantities of seed of these varieties have been supplied and it is estimated that about 43,680 acres were under these varieties during the year.

4. *Fodder crops*.—Propaganda in connexion with the cultivation of fodder crops was continued and 14,350 slips of guinea and elephant grasses, 115 lb. of cholam seed and 5 lb. of lucerne seed were supplied to ryots for raising fodder crops. The growth of hill grass during the year was poor and silage preparation could be done only in four places, but 14 demonstrations were held to show the ryots how to prepare proper hay from hill grass.

5. *Fruit culture*.—A great deal of impetus was given to the development of fruit culture in the circle. Constant applications for supplying planting materials especially pineapple suckers and mango grafts are being received. The response from the educated and well-to-do classes of people for the development of fruit culture is appreciable. Advice on the proper selection of grafts and their planting and assistance in securing suckers and grafts were given to them. An awakening has been created to extend fruit culture in dry lands which is now lying waste in most cases. To meet the increased demand for grafts and suckers nurserymen in the circle have been persuaded to extend their nursery areas. During the year 57,700 pineapple suckers, 3,922 mango grafts and 1,945 sapota grafts were supplied to different applicants through the assistance of the department. There is ready demand for pineapple fruits especially of the Kew variety and during the season in most of the West Coast towns these fruits are a speciality and outsiders come to purchase them, especially from Mysore and Bangalore side. A large quantity of fruit is consumed locally by coffee hotels for preparing fruit salad.

6. *Nendrum plantain*.—Propaganda to spread the cultivation of nendrum plantain (the famous Malabar variety) in South Kanara is being continued. This variety is well known for its keeping quality and finds ready sale in the market. This is one of the money crops of Malabar and attempts are being made to spread its cultivation in different localities in the circle. During the year 6,437 suckers were supplied to applicants in the circle.

7. *Cashewnut*.—On account of propaganda to increase the production of cashewnuts to meet the high demand, the cultivation of cashew is spreading in the circle. In recent years, large blocks of waste lands have been planted up with cashewnut. There is keen demand for selected seed nuts and as far as possible the demand is met and during the year 3,192 lb. of seed and 11,500 seedlings were arranged to meet the demand.

8. *Coconut*.—The 14 demonstration plots maintained by the District Board, South Kanara, under the supervision of the department received the attention of the demonstrators. On account of financial stringency the district board has considerably reduced the allotment for their maintenance and the amount placed at the disposal of the department was carefully spent in manuring and inter-cultivating these plots. Some of the plots have begun to yield and bring in revenue to the district board.

In general, cultivators are not in a position to pay adequate attention to the proper maintenance of coconut plantations on account of low price for nuts. A good deal of persuasion was necessary to make them pay proper attention to this crop. On account of the unfavourable season, the yield of coconut has considerably gone down during the year. In spite of depression new areas have been planted to a limited extent and the demand for seed nuts and seedlings produced at the coconut research stations was great. During the year, 2,758 seed nuts and 3,032 seedlings were supplied from the research stations and reliable nursery men.

9. *Tapioca*.—The cultivation of superior varieties of tapioca such as Butterstick and Rottikapa is spreading in the circle. There was demand for cuttings of these varieties and steps were taken to supply 136,355 cuttings. It is one of the popular crops among the poorer classes of people in Malabar but in recent years efforts are being made to spread its cultivation in South Kanara. During the Industrial and Agricultural Exhibition at Mangalore, tapioca and its products were exhibited and many people took keen interest in these exhibits and took cuttings of these superior varieties. In Wynad it is spreading and about 30 acres have been planted against 15 acres in the previous year.

10. *Pepper*.—Propaganda to spread the cultivation of pepper in South Kanara was continued. During the planting season, 15,500 cuttings were distributed and assistance was rendered in their proper planting. In Malabar also there was demand for good cuttings and demonstrators took steps to supply 25,050 cuttings from good bearing vines.

11. *Sugarcane*.—On account of the prospect of starting a sugar factory in South Kanara, there was a tendency to increase the area under sugarcane in the district and the demand for cuttings of improved varieties was very great. According to the crop report for 1935, the area under sugarcane in South Kanara was 3,900 acres against 3,720 in the previous year. All available cuttings mostly of J. 247, Red Mauritius and M. 55 from the Taliparamba Research Station to the extent of 26,000 were supplied to ryots. In addition to this, arrangements were made to supply selected cuttings locally to the extent of 2,63,175 mostly of Red Mauritius and Fiji B varieties. In certain localities, Red Mauritius shows a tendency to deteriorate and ryots are anxious to replace this with Fiji B and the area under Fiji B is gradually increasing. During the year about 150 acres were planted with Fiji B against 78 acres in the

previous year. Co. 213 which was recently introduced into the district is appreciated by ryots on account of higher percentage of jaggery obtained from this cane compared with Red Mauritius. Ryots are slowly increasing the area under this variety and 7 ryots in 4 villages were supplied with 6,000 setts. As Kallianpur in Udipi taluk is likely to become an important cane growing tract on account of the starting of the sugar factory, a dozen of the Coimbatore seedling varieties were planted in small plots for trial purpose during the year.

In Malabar, sugarcane is a minor crop and there were only 20 acres under this crop in the previous year. The results of its cultivation in Wynad and Calicut taluks were encouraging and the area under the crop in the district has risen from 20 to 30 acres during the year. There is likelihood of the area going up during the coming years. About 20,000 setts were supplied to ryots in Wynad.

Iron mills and improved furnaces are in use in most of the sugarcane growing areas in this circle and during the year assistance was rendered in constructing 183 improved furnaces.

12. *Agricultural implements, tools and small machinery*—
(a) *Ploughs*.—To popularize the use of small iron ploughs, 342 demonstrations were held in different parts of the circle mostly in Wynad where the use of iron ploughs is getting popular. During the year, 46 iron ploughs, mostly Cooper No. 25 were sold of which 32 were purchased by ryots in Wynad. The ploughs purchased are constantly put to use by ryots and 99 spare parts mostly shares were supplied to them.

(b) *Mhote wheels*.—Efforts to popularize the use of roll easy mhote wheels in the arecanut growing areas of the Ponnani taluk were continued and 10 wheels were purchased by ryots during the year. In the course of three years, 30 wheels were purchased by arecanut growers in this taluk.

(c) *Sprayers*.—Continuous propaganda and demonstrations were carried out for the past two years in South Kanara to popularize the use of sprayers for spraying arecanut gardens affected with mahali disease. The effect of the propaganda was seen during the year and 110 sprayers were purchased by ryots in Puttur and Kasargod taluks where the disease appeared in a virulent form.

(d) *Tools, etc.*—The use of beetle-rods for removing beetles from the crowns of coconut trees and improved digging forks for interculture were demonstrated and 66 beetle-rods and 15 digging forks were supplied to ryots.

13. *Manures*—(a) *Cattle manure*.—Proper collection and preservation of cattle manure continued to receive attention especially in Malabar district, where the method is very defective. In the course of the year, 569 covered manure pits, 2 loose-box cattle-sheds and 14 dry-earth sheds were constructed. In the past years, 1,475 covered pits were made and efforts are being made to keep these pits in proper condition. In certain places, it was noticed that ryots neglect to renew the roofing of these sheds.

(b) *Utilization of organic waste as manure*.—In places where ryots have cattle, all available organic waste is made use of as litter but in the case of those who have no cattle such organic waste is made to put into compost pits. Composting of water hyacinth was advocated in some places in Ponnani and Palghat taluks. Efforts are being made to interest the several municipalities in the circle to prepare compost with the municipal rubbish and night-soil, but so far no appreciable progress has been made for want of co-operation on the part of the municipal authorities.

(c) *Poudrette*.—For the last three years, efforts are being made to demonstrate the usefulness of poudrette as a manure. Calicut Municipality gave it free of cost and the department met the cost of transport and application of this manure for paddy. For the succeeding paddy, the ryots contributed half the cost of transport and seeing the successful results now they have consented to bear the whole cost of application. It is hoped, that in course of years, the useful manure will be utilized by ryots in greater quantities. Similar propaganda was done round about Mangalore with success.

(d) *Green manure*.—The growing of kolinji for green manure purpose formed one of the major items of work in the circle. During the year 33,027 lb. of kolinji seeds were supplied to ryots against 27,142 lb. in the previous year. For the last few years continuous efforts are being made to popularize this improvement and year after year a steady progress has been achieved. Although it is not possible to grow green manure crops in the major portion of the cultivated paddy area, yet it is hoped that a fair portion of the land along the Coast where there is difficulty for getting green leaf can be brought under this improvement. In certain localities, where kolinji has been successfully grown in the past one or two years, a portion of the area is getting self-sown. In single-crop paddy lands, where sowing of kolinji takes place in October-November, pods mature before the crop is ploughed into the soil. In such areas, ryots are encouraged to collect seed for their future use and sale to the department. About 2,000 lb. of local seed are available for purchase and further impetus will be given to the local production. The use of kolinji for manuring sugarcane was also demonstrated and 78 acres of sugarcane were manured with kolinji. In addition to kolinji 915 lb. of daincha and 1,328 lb. of cowgram were used for green manure purpose, the latter is mostly for manuring the coconut gardens. Ryots appreciate this cheap method of manuring and this item of work is expected to develop in coming years.

(e) *Concentrated manure*.—Firms engaged in fertilizer trade have their depots in different parts of the circle and effect sales of bone-meal, ammonium sulphate, superphosphate, ammophos, nicifos, oil cakes and other special fertilizers. These manures are mostly used for sugarcane, tobacco, plantains and vegetables. There is no doubt that ryots appreciate concentrated manures but

the low prices for agricultural produce stand in the way of extensive use of these manures. As far as information is available from the different manure firms nearly 346 tons of fertilizers were sold by them to ryots in the circle. During the year there was good catch of fish and about 400 tons of fish manure were used for manuring tobacco and sugarcane crops.

15. *Pests*—(a) *Water hyacinth*.—Pest Act was in force in respect of water hyacinth in Ponnani, Ernad and Palghat taluks of the Malabar district. The demonstrators working in these taluks brought to the notice of the inspecting officers the existence of the pest whenever they came across it. Ryots were advised to prepare compost out of it, for manurial purpose. Gradual progress is seen in the eradication of the pest but it will take some more years for its complete eradication.

(b) *Paddy pests*.—The major pests that appeared during the year were rice hispa and rice bug in South Kanara, *Spodoptera*, Grasshopper and *Ripersia Orizae* (Soorai) in South Malabar. The district staff and the Entomology Assistant rendered help to ryots in controlling these pests and there was not much damage.

(c) *Coconut pests*.—The coconut caterpillar—*Nephantis serinopa*—made its appearance in a pest form in some of the coastal villages in Ponnani, Kurumbranad, Chirakkal and Mangalore taluks. About 4,718 trees were operated to control the pest in these taluks. Ryots are conversant with the control operation and timely assistance is being rendered to them wherever the insect appeared in a pest form.

16. *Fungus diseases*—(a) *Mahali disease of arecanut*.—This disease appeared during the rainy season both in South Kanara and Malabar. As the garden owners are conversant with the control measures in Malabar the damage caused by the disease was not much but in South Kanara this disease did considerable damage to the crop. The disease appeared in a virulent form in most of the arecanut growing villages in Coondapoor, Puttur and Kasaragod taluks. From June to September special staff was stationed at Shankernarayana and Bayar, the worst affected areas and spraying with Bordeaux mixture was demonstrated to control the disease. This is the second year of the campaign and 385,000 trees were sprayed by garden owners in different areas against 116,150 trees in the previous year. Arecanut being an important money crop of the district, all possible attention was bestowed and considerable time and energy were spent on this work. Garden owners in the interior villages take steps for spraying only after the disease was noticed and run for chemicals and sprayers to distant places. Now arrangements have been made through the co-operation of the firms dealing in chemicals and sprayers to open depots in different centres. Coolies were trained in preparing the Bordeaux mixture and spraying. The department has made arrangements to stock a limited quantity of chemicals in some of the central villages. All these preliminaries will assist the ryots in taking prompt action in case the disease appears in the coming season. In the case of

poor ryots who cannot afford to invest money on the purchase of sprayers, a few takavi loans were granted for this purpose. All that could be done has been done by the department.

(b) *Budrot of palmyra and coconut*.—The Pest Act which was brought into force from the beginning of March 1933 to control this disease was in force during the year in Palghat, Ponnani and Walluvanad taluks. The worst affected area is in Palghat taluk. Three of the subordinates of the Agricultural Department and a Special Revenue Inspector were on Pest control duty and took steps to cut 6,445 diseased trees during the year. Ever since the Pest Act came into force, a large number of trees have been cut and the spread of the disease has been greatly checked. Yet here and there a few diseased trees are standing and fresh attacks are cropping up. Consequently the period of the Act was further extended to the end of March 1937.

17. *Demonstration plots*.—The 14 coconut demonstration plots financed by the District Board of South Kanara and two plots belonging to the department continued to receive attention. As the activities of the demonstrators were extended to a larger number of central villages during the year, the number of demonstration plots and their distribution were spread to a wider extent and 851 plots were started. These plots were organized mostly to demonstrate varietal, cultural and manurial improvements on paddy, sugarcane and fruit plants. Although attempts were made to maintain cultivation sheets for these plots, accurate results could not be recorded in all cases. These demonstration plots have served their purpose and shown economic advantages of the improvements suggested by the department.

18. *Trial plots*.—Sixteen trial plots were worked during the year of which eight pertain to paddy strains, two to ginger varieties, five to poudrette manure and one to sugarcane. All the trials were successful and they have given higher yields over the check plots.

19. *Work in the Laccadive Islands*.—The deputation of an agricultural subordinate to the Laccadive Islands was discontinued during the year. The appointment of three demonstration maistris to be permanently stationed, one in each of the three islands, Agathi, Kavarathi and Amini divi, was sanctioned by the Government and three islanders who had training at the coconut research stations in the West Coast were appointed during the latter part of the year and sent to the respective islands to work under the supervision of the Amins and Monegars. Their work will be inspected periodically by an agricultural subordinate accompanying the Island Inspecting Officer.

20. *Joint work with the Co-operative and other departments*.—The co-operative loan and sale societies started for the benefit of the pepper growers at Taliparamba and Kotacherry continued to receive assistance from the Agricultural staff, but on account of low price for pepper substantial work could not be turned out during the year.

Two co-operative societies, one at Uppur and the other at Badragiri in South Kanara district were organized for the benefit of the sugarcane growers round about Kallianpur where the construction of a sugar factory is in progress. About 13,000 sugarcane setts of the improved varieties were supplied to the members of these two societies.

The Revenue authorities in the circle were kept in touch with the activities of the department and the demonstrators attended jamabandi camps preside over by Revenue officials and delivered lectures on agricultural improvements for the benefit of the village officers and the ryots gathered.

Short summaries of the work of the department were supplied to the Collectors of Malabar and South Kanara for publication.

21. *Joint work with the public bodies.*—The agricultural farm attached to the school at Tanur maintained by the Devadar Malabar Reconstruction Trust continued to receive the attention at the hands of the department and the usual annual grant of Rs. 75 with the services of a head coolie to run the farm was granted. During the year poultry breeding was started at the farm and attention was paid to develop fruit culture.

22. *Agricultural associations.*—The District Advancement Association, South Kanara, organized an Agricultural and Industrial Exhibition at Mangalore during the year and the department co-operated in organizing the show.

The Agricultural Association, Palghat, continued to maintain a breeding bull under the premium scheme and assisted the ryots with finance for purchasing green manure seeds. The breeding bull was active in service and premium was granted.

23. *Exhibitions and shows.*—During the year two big exhibitions were held one at Calicut and the other at Mangalore. The exhibition committee in both these places awarded gold medals to the department for its interesting collection of exhibits. In addition to this, four small exhibitions during important festival occasions and 32 shows during jamabandi camps were arranged.

24. *Motor Exhibition Van.*—The Motor Exhibition Van, Unit II, toured in this circle from 1st April 1935 to 5th June 1935 and 16th February 1936 to 31st March 1936. During these periods it visited important centres in the circle and 98 shows were held. In all the places visited lantern lectures were delivered on important agricultural topics. Officers of other departments, namely, Revenue, Veterinary, Public Health, Co-operative and Fisheries took interest and helped in making the shows successful.

25. *Improvement of livestock.*—(a) *Breeding bulls.*—The breeding bulls maintained by the department, two at the Veterinary Hospital, Mangalore, and one at Cannanore, continued to be popular and performed 151 services. The breeding buffalo bull at Taliparamba Research Station did not perform many outside service except one or two. During the year the number of breeding bulls

maintained on premium scheme was increased to 13 against 12 in the previous year and they performed 446 services. Of these bulls, two were maintained by the District Board, South Kanara, two by co-operative societies, one by agricultural association and the rest by private individuals.

(b) *Poultry.*—The demand for eggs and birds of improved breeds of poultry mostly of white leg-horn breed, increased during the year and 658 eggs and 29 birds were supplied to ryots mostly from Hosur Livestock Research Station. To meet the increased demand, poultry breeding has been started at the Taliparamba Research Station.

26. *Apiary.*—Due to propaganda work, a desire for bee-keeping was created in the minds of the educated people and demands for technical advice is constantly increasing. Assistance was rendered in supplying hives, capturing wild colonies and maintaining them in proper condition. The number of hives maintained in the circle has increased to 102 against 31 in the previous year and 141 wild colonies were hived.

27. *Loans.*—Fourteen takavi loans amounting to Rs. 300 were granted for purchasing roll easy mhothe wheels and sprayers.

28. *Publications.*—During the year 3,569 Villagers, calendars and 177 bulletins were sold in addition to the free distribution of a large number of leaflets. Short notes on important agricultural topics were published in the vernacular papers.

III.—THE AGRICULTURAL RESEARCH STATION, TALIPARAMBA.

29. *Season.*—The total rainfall during the year was below normal and the seasonal factors were favourable to paddy and unfavourable to dry land crops, pepper and coconut.

30. *Research.*—Investigation on the manurial requirements of pepper and trials of different varieties of sugarcane, plantain, ginger, chilli, fruit and medicinal plants were continued.

31. *Bee-keeping, poultry and dairy herd.*—Bee-keeping, maintenance of a small dairy herd and poultry breeding received attention.

32. *Seed supply.*—The demand for various kinds of seeds and planting materials produced at the station was great and the following seed materials were supplied to the cultivators :—

Sugarcane setts 28,150, pepper basket layerings 50, paddy seed 7,743 lb, pineapple suckers 2,564, chilli seedlings 2,975, coffee seedlings 739, nendrum and other plantain suckers 286, cashewnut seed 318 lb., muruku seed 3 lb. and ginger seed 505 lb.

TELLICHERRY, K. T. ALWA,
2nd July 1936. Deputy Director of Agriculture, VII Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, VIII CIRCLE, FOR THE YEAR
1935-36.

I.—CHARGE.

M.R.Ry. Y. G. Krishna Rao Nayudu Garu was in charge of the circle till 23rd September, on which date I took over and continued till the end of the year.

2. There were frequent changes in the post of the Assistant Director of Agriculture, Salem, during the year.

3. M.R.Ry. A. Chinnathambi Pillai Avargal was on special duty with the Lower Bhavani localization party from April to September 1935. From October till the end of the year, he continued as Assistant Director of Agriculture, Coimbatore.

Staff.—There were 11 Agricultural Demonstrators in Coimbatore, nine in Salem and two in the Nilgiris. In addition, two Agricultural Demonstrators were engaged in Lower Bhavani Project experiments and six Agricultural Demonstrators were working under the Business Manager in the Co. 2 seed multiplication scheme. M.R.Ry. V. K. Subramania Mudaliyar continued as Superintendent, Agricultural Research Station, Nanjanad, with two Farm Managers and one Probationary Farm Manager.

II.—DEMONSTRATION.

(1) *Season and rainfall.*

In Coimbatore, the district average amounts to 25.06 inches which is 7.81 inches below the sixty-year average. Palladam recorded only 15.45 inches, Coimbatore 16.13 inches. Generally speaking the rainfall was insufficient and unevenly distributed in Coimbatore, Avanashi, Palladam, Erode and Dharapuram taluks. Irrigation water in wells was insufficient and garden crops consequently restricted. Sowings of cotton were continued up till the end of November.

In Salem, 30.71 inches were recorded. Attur, Krishnagiri and Hosur received favourable rains, but in the remainder of the district up till August rainfall was insufficient. Good rains in August helped crops considerably. September and October rains were fairly good except in Salem and Rasipur. The latter half of the north-east monsoon was disappointing and affected late-sown crops of cotton, paddy, etc.

In the Nilgiris, the average rainfall was 68.31 inches. In Ootacamund, the early rains were light and the south-west monsoon weak. The north-east monsoon was active at the beginning

but short-lived. In Coonoor, the north-east monsoon rains were favourable. Rains in February and March 1936 brought on early blossom of fruit-trees and coffee.

(2) *Crops.*

(a) *Cereals.*

Thirteen thousand two hundred and thirty-seven pounds of paddy seed in twenty varieties were distributed in the year. GEB. 24, Co. 1 and Co. 2 continue to be popular in the non-canal areas and the longer varieties in canal-fed areas. The total area under improved varieties is estimated at nearly 30,000 acres, of which only about 450 acres represent direct supply. The main distribution is now done by the growers themselves while our work is confined to the issue of seed to selected ryots to maintain purity. Among recent introductions Co. 10 and Co. 11 have done well in Coimbatore against local Gobi kar and Ayyan samba, respectively. Twenty-three thousand seven hundred pounds of seed of these varieties raised is being kept by the ryots for sale distribution during the coming season. In Salem T. 670 from Bengal tried against G.E.B. 24 gave increases in five out of six plots and in other two cases gave increases of over 20 per cent. Straw yield was also better. Crosses 10783 B.K. and 10905 B.K. also did well and will be tried on a larger scale during the coming season. Propaganda for the reduction of seed-rate in the nurseries is still being continued.

Cholam.—Over 10,000 lb. of cholam seed in eight varieties were distributed and tried during the season. Periamanjil cholam continues to be popular especially for fodder and T. 1 and T. 12 jonna are also becoming popular for this purpose. Many of the plots were not conclusive and further trials are required.

Cumbu.—Two hundred and twenty-nine pounds were distributed and punja cumbu is popular in some places for its large ear-heads and good straw.

Ragi.—One thousand two hundred and fifty-eight pounds of E.C. 593 ragi were distributed in Coimbatore and in spite of its two weeks' longer duration, it is popular and ryots are distributing the seed among themselves. The total area is now estimated at 330 acres.

Bengal-gram.—Several strains of bengal-gram have been tried in the district. Strain 468 has been successful in Dharmapuri taluk where increases of up to 32 per cent with an average of 15 per cent over four places were recorded.

Wheat.—Pusa 52 wheat has done well in parts of Coonoor taluk yielding 50 per cent more than local. The area has increased to 6 acres.

(b) Fibres—Cotton.

Acres 853.98 of Co. 2 Cambodia seed-farms were grown this year departmentally and of the 188,846 lb. of seed produced, 183,663 lb. were distributed in the circle. Acres 744.95 of C. 7 Karunganni seed farms yielded 54,992 lb. of seed of which most was distributed within the circle.

Acres 883 of Co. 2 Cambodia and 542.39 acres of C. 7 Karunganni seed farms were sown during the year. Further Cambodia seed was made available in the circle by the Co. 2 seed multiplication scheme which will be dealt with under co-operation. In addition, many of the merchants and ginning factories are following the methods adopted by the Agricultural department in the production of good seed and as ginning factories have sprung up all over the district, they are having an appreciable effect in maintaining the supply and effecting the spread of Co. 2 seed.

Some merchants and ryots are also importing Karunganni seed from the Tinnevely area. One thousand two hundred and seventy-eight pounds of Uppam seed were distributed. Line sowing of Cambodia is spreading both in Coimbatore and Salem as a smaller seed-rate is required and intercultivation by bullock power can be practised. The area is now nearly 4,500 acres. Improvements in kapas picking have been demonstrated in certain parts of Salem with distinct improvement to the quality of the produce.

(c) Fodders.

Of the various fodder crops, which have been tried, periamanjol cholam is adopted by the ryots as most suitable. T. 1 and T. 12 jonna, teosinte, guinea grass, elephant grass, pillipesara and lucerne have also been tried and of these lucerne will probably prove most satisfactory grown on small areas under well irrigation for several years on end. It is estimated that there are now about 108 acres scattered in small plots over the district. A certain amount of seed is being produced locally and 37 lb. were purchased from outside for sale distribution. One hundred and ninety-two pounds of kolukattai grass, 5,200 elephant and guinea grass slips and 101 lb. of teosinte were sold.

(d) Fruits.

In general, cultivators are giving a little more attention to fruit cultivation, but in certain cases, e.g., Salem nursery men have adopted methods of propagation especially in mangoes which are against the cultivators' interests and also their own. They do not pay sufficient attention to the selection of stocks and scions. A considerable amount of propaganda and demonstration is being done in maintaining the health of fruit-trees by spraying, pruning

and manuring both in the hill districts and the plains. The area under plantains is still increasing. The following fruit plants have been distributed :—

Pineapple suckers	...	...	...	...	250
Citrus trees	...	...	...	...	184
Mango trees	...	...	...	...	106
Fig cuttings	...	...	...	...	8
Grape vines	...	...	...	...	2
Pomegranate	...	...	...	...	2
Jack	...	...	...	...	4
Durian	...	...	...	...	1
Cashewnut seed	...	...	...	...	71 lb.

(e) Vegetables.

Onions.—One hundred and thirty-seven pounds of Bellary onion seed were distributed by the department and a considerable amount of seed was obtained by merchants direct and supplied to ryots. In parts of Salem trials in seed production are being made as there are difficulties sometimes in obtaining sufficient supplies.

Potatoes.—One thousand four hundred and two and a half maunds of potato seed were issued on seed farm conditions in 39 villages on the Nilgiris by the Agricultural Demonstrators, Ootacamund and Coonoor. In addition, 27,527 lb. were sold outright. The seed farm yields were invariably superior to the local seed yields and varied from a minimum of 296 to 700 maunds per acre for early crop. Two hundred to nine hundred and fifty maunds in main crop and 300 to 700 maunds in the second crop. Great Scot was the variety mostly distributed and a smaller quantity of Ben Cruachan. As there is a decided preference for Great Scot, its distribution will be increased. One thousand, five hundred and twenty-five pounds of this variety were sold in Hosur taluk and the results were good.

(f) Sugarcane.

Three hundred and thirty-five thousand, eight hundred and thirty-five setts in 15 varieties of sugarcane were distributed during the year. With the increase in the number of varieties available, attention is being paid to the selection of varieties most suitable for the different parts of the circle. Among the thin canes, Co. 213 and 290 have established well, e.g., in Avanashi taluk these varieties are now grown on 70 per cent of the area. Of the newer varieties introduced, Co. 413, 417, 419 and 421 are very promising under different conditions while in the northern taluks of Salem Co. 360, H.M. 320 and H.M. 544 are being tried also. It is estimated that there are now 3,759 acres under improved varieties.

Improvements in methods of cultivation, manuring and preparation of jaggery have also to be recorded. Trench planting is becoming popular and the use of economic furnaces like the Sindhewahi is increasing where ryots make their own jaggery. Larger furnaces are preferred by contractors who are paid on output. Cream jaggery demonstrations to the number of 177 were carried out.

(g) Oil-seeds.

Two thousand, four hundred and eighty-five pounds of A.H. 25 groundnuts were distributed for seed. Salem results showed 20 per cent increase over locals and a considerable increase in the area under this variety may be expected in the coming years.

Coconuts.—Two hundred and fifty-two coconut seeds from the West Coast were distributed.

Linseed.—Trials with linseed in North Salem are promising and as a result of last year's trial, one ryot sowed 7 acres. Owing to a less favourable season this year's crop was not so good, but an increase in the acreage may be expected in coming years.

(3) Implements.

Ploughing demonstrations were conducted 998 times and 351 ploughs and 1,191 spare parts were sold. Of these, 165 were Cooper No. 11. H.M. Guntakas were demonstrated on 254 occasions and 14 were sold. One hundred and thirty-one mhote wheels, 16 bund-formers, 3 junior hoes and 1 chaff-cutter and 1 buckscraper were also sold. A new turmeric polisher has been successfully demonstrated in Gobichettipalayam and Erode taluks.

(4) Manures.

Propaganda on conservation of Farm yard manure has been continued and 416 pits were opened and urine conservation by dry earth system in 125 places.

Green manures.—Green manure seeds to the extent of 22,249 lb. were distributed as follows:—

	LB.
Kolingi	11,169
Daincha	6,753½
Sunnhemp	2,862
Pillipesara	780
Indigo	649½
Lupins	35

The preparation of compost from Municipal rubbish by the Indore process was explained and discussed with several of the Municipalities in the district. Trials were made in Coimbatore and Salem. The economic aspects are being studied by these municipalities. The Central Jail, Salem, started in February and are carrying on with it and are apparently satisfied.

Concentrated manures.—Good sales of concentrated manures and mixtures have been reported for such crops as potatoes, sugarcane and tobacco. The importance of these manures is recognized by the ryots and plots have been laid down in the Nilgiris to test the value of various firms' mixtures on potatoes. Tobacco and Sugarcane ryots are also recognizing that economical increases of crop may be obtained by their use. A manurial and irrigation experiment at Krishnagiri on grape vine gave an increased return of Rs. 145 per acre after deducting the cost of manure.

(5) Pests and Diseases.

One hundred and ninety-six demonstrations were carried on the control of pests and diseases, of which about 178 were with sprays both wet and dry. Ryots are more freely utilizing the advice of the department in this respect and are carrying out the remedial measures themselves. Three hundred and thirty-eight packets of fungus sulphur and 155½ lb. of fish-oil soap were sold in Salem. Seed treatment with Agrosan and Ceresan was done in several cases with good results.

(6) Pest Act.

The work of eradication of all Cambodia and Pachanadan cotton by 1st September proceeded smoothly and with some exceptions was completed by 1st September. Of 30 defaulters in Coimbatore, seven were fined and the remainder warned. In some cases, it was found that cutting of the plants at ground level was done instead of pulling out. Such cases were brought to the notice of the Revenue officials concerned.

The Anamalai non-pest Act area was brought under the scope of the Act this year, but owing to the late rains the kar pickings were not concluded by September 1st and an extension of time till 21st October was granted. It was decided at a meeting presided over by the Hon'ble Minister for Development that the necessary data in regard to this tract should be collected over a period of three years so that a permanent policy might be laid down.

(7) Trial Plots.

One hundred and four trial plots were laid down mostly varietal in sugarcane, paddy, cholam, cumbu, tobacco, bengalgram, groundnut and cotton.

(8) Demonstration.

Demonstration centres in Coimbatore and Salem number 158 with another eight in the Nilgiris. In all, 729 demonstrations were carried out at these centres mostly varietal. In the case of new varieties of sugarcane and paddy, several considerable increases over the local varieties were recorded.

(9) *Work with other departments.*

The Assistant Director of Agriculture, Coimbatore, was on special duty with the Lower Bhavani Project localization party and visited 135 villages in Erode, Bhavani and Gobichettipalayam taluks in that connection.

The Lower Bhavani Project irrigation experiments were carried on during the year in co-operation with the Public Works Department at Chennasamudram on 100 acres during the first crop season and at Kugalur on 100 acres during the second crop season. Special reports on these experiments giving the results of the amount of irrigation required and the yields and values of the crops obtained are being submitted as the results become available. The ryots on whose land the experiments are being carried out, do all the work themselves under control of Agricultural and Public Works Department officers and the experiments are as far as possible under project conditions.

Co-operative Department.—The Co. 2 Seed Multiplication Scheme, which is financed by the Indian Central Cotton Committee, run in conjunction with the Tiruppur, Co-operative Trading Society, Tiruppur, produced 8,183 pothies 2 maunds and 17 lb. of seed farm kappas last year from an area of 5,152 acres and sold 1,009,471 lb. of first-class seed to the ryots for sowing. During the present season, 5,320 acres of seed farms have been sown and the crop is now being received in the ginning factory. Owing to the bad season, the yield of kappas this year is expected to be somewhat below that of last year and the quality of the kappas is hardly so good. The staff lent for the purpose consists of the Business Manager and six Agricultural Demonstrators.

The Co-operative Societies at Rasipuram, Edapadi and Pudupatti in Salem are doing good work in promoting the picking of clean kappas and stocking Co. 2 Cambodia seed for sale. The last society maintains a buffalo breeding bull and the Agricultural Demonstrator is giving a regular course of lectures once a fortnight to the society members on different aspects of work in which they are interested. Such organized courses of lectures would appear to meet a definite need for the dissemination of agricultural knowledge and as practical work and demonstration go hand in hand, improvements are more easily obtainable.

A sugarcane growers' association started in Podanur was supplied with setts of the most suitable new varieties of cane and manurial plots were also laid out on members' land. One thousand, two hundred and forty-two tons of cane from 33 members were sold to the sugar factory and a premium of annas four per ton was obtained from the factory.

Several other societies maintain bulls and were given help during the year.

(10) *Exhibitions and Shows.*

Twenty-five exhibitions were held during the year and at Kalipatti a ploughing competition was held. The motor exhibition van toured for 46 days in the circle. Sixty-eight lectures were delivered with and without the magic lantern. The Touring Veterinary Assistant and a Co-operative Inspector accompanied the van for 14 days and 20 days, respectively.

(11) *Livestock.*

The following premium bulls were at stud in the circle during the year :—

	Coimba- tore.	Salem.	Total.
Maintained by District Boards ...	36	1	37
Loaned to Central Jails ...	2	2	4
Idigarai Co-operative Society ...	1	—	1
Loaned to Coimbatore Municipality ...	1	—	1
Owned by private parties ...	14	4	18
	54	7	61

Twenty new bulls were purchased by the Coimbatore District Board during the year and the department paid a contribution of Rs. 2,000. These bulls are entrusted to ryots who maintain them and at the end of two years, they become the ryots' property provided the conditions in regard to service are satisfied. All bulls are regularly inspected by the staff. At the time of payment of premium to private bulls prizes are awarded to the best male and female calves born to the bull in the previous year. The ryots are taking a growing interest in the scheme.

Poultry.—There are a number of poultry farms in the hills with imported stock and a few on the plains. Sales of eggs of imported breeds amounted to 85 and birds 30. In addition, 2 rams and 2 piglings were sold.

(12) *Loans.*

Takkavi loans to the extent of Rs. 990 were granted during the year to 98 ryots representing the purchase of 74 Roll-easy Mhote wheels, 43 ploughs, 1 sprayer and 1 guntaka.

(13) *Publications.*

The following publications were sold in addition to free distribution of a large number of leaflets, handbills and pamphlets :—

Villager's Calendars ...	1,742
Bulletins and other publications ...	334

III.—AGRICULTURAL RESEARCH STATION, NANJANAD.

1. *Charge*.—Mr. V. K. Subramania Mudaliyar was in charge throughout the year.

2. *Season*.—The total rainfall recorded was 45.19 inches over 139 days as against 35.39 inches over 129 days last year. The season was more favourable for samai than potatoes.

3. *Research*.—Experiments on the manurial requirements of potatoes and the most suitable varieties were carried out. In second earlies, Great Scot and in Main crops, Ben Cruachan are best. Ten new varieties of which only two survived, were obtained from Russia and 5 from Scotland. Under the scheme for breeding potatoes, 7,902 flowers were artificially pollinated during the year. One hundred and forty-three berries were obtained and 1,000 seedlings raised. The raising of seedlings has been much more successful since protection from the elements was given.

4. *Potato crop*.—The irrigated, main and second crops yielded 484, 633 and 440 maunds per acre, respectively.

5. Samai yielded 663 lb. grain and 3,208 lb. straw per acre. The straw yield is the highest recorded in the station.

6. *Trial crops*.—Of the several crops tried, Resistance Oats (imported), bengalgram, lucerne, clover, maize and soy-bean were fair to good.

7. *Seed distribution*.—One thousand nine hundred and ninety-four maunds of potatoes, 2,411 lb. of samai and 115½ lb. of lupin, were supplied from the station.

8. *Petty construction and repairs*.—Improvements both to residential and non-residential buildings were executed during the year at a cost of Rs. 200 and Rs. 726-8-0, respectively.

COIMBATORE, D. G. MUNRO,
29th April 1936. Deputy Director of Agriculture, VIII Circle.

(10)

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, LIVESTOCK, HOSUR CATTLE FARM, FOR 1935-36.

Mr. T. Murari was in charge of the section up to the 10th September 1935 when he handed over charge to me in the afternoon, and relieved Mr. A. Gopalakrishnayya as Superintendent of the Livestock Research Station, Hosur.

2. Mr. Murari visited Bangalore, Mysore and Hunsoor Forests to inspect Mysore cattle, inspected the cattle of the Pattagar of Palayakottai along with the Imperial Dairy Expert with regard to the starting of a Dairy Farm, attended the Tiruppur Cattle Fair, inspected sheep on the Nilgiris, cattle in the Chittoor district, cattle and sheep in Kurnool district, visited the Agricultural College Dairy, Coimbatore, Guntur and Kalahasti Agricultural Research Stations. He inspected the proposed site at Pratur in Guntur district for a Buffalo Breeding Station and inspected bulls in the Tanjore district.

3. I inspected cattle and poultry at the Agricultural College Dairy, Coimbatore, Pattambi, Taliparamba, Palur, Aduturai and Koilpatti Agricultural Research Stations. I selected a buffalo bull for the Principal, Agricultural College, from the stock at the Imperial Dairy Institute, Bangalore. I selected and purchased a Kangayam breeding bull for the Hosur Livestock Research Station from the Palayakottai herd, inspected the Ayrshire bull and some of its progeny at Ootacamund, inspected the Sind bull at Cannanore and interviewed some candidates at Tellicherry for the posts of poultry maistries.

Livestock.—The total head of stock at the end of the year under my control, amounted to 634, detailed as follows :—

Breed.	Cows and heifers.	Breeding and young bulls.	Calves.		Work cattle.	Total.
			Heifers.	Bulls.		
Kangayam	189	61	32	33	14	* 329
Ongole	1	3	..	1	11	16
Sind	97	41	17	15	3	173
Crossbred	25	7	15	3	18	68
Hallikar	25	5	4	3	..	37
Buffaloes	..	..	..	..	2	2
Horses and mules ..	..	..	..	..	8	8
Control	1	..	..	..	..	1
Total	338	117	68	55	56	634

* Includes six at Koilpatti.

Crossbred herd.—All the cows and heifers in this herd are served by a Sind bull to breed back to the indigenous breed and

cows in milk are transferred to the Agricultural College Dairy, Coimbatore. Heifer calves and a few bull calves are transferred from Coimbatore to Hosur for rearing. The crossbred herd at the Coimbatore Agricultural College is under the charge of the Principal.

At Hosur there were 44 head of stock at the beginning of the year. There were five births (three heifers and two bulls), six heifers, 19 heifer calves and four bull calves were received from the Coimbatore Agricultural College Dairy and one bull from the Madras Veterinary College.

Five cows and a calf were sold, nine cows transferred to the Agricultural College Dairy, six animals died, one bull transferred to Madras and six work bulls transferred to Nanjanad and one bull to work cattle leaving a balance of 50 at the end of the year.

At Hosur there were 2.7 cows in milk on the average throughout the year and they produced a daily average of 15.1 lb. per cow.

At the Agricultural College Dairy, Coimbatore, there were 21.9 cows in milk throughout the year on the average and the daily average yield per cow amounted to 15.5 lb. milk. The best lactations are—

Cow number.	Milk yield.		Daily average.
	LB.	LB.	
303	9,694	19.5	still in milk.
323	8,923	23.2	
322	9,197	20.2	
287	7,439	23.3	
227	7,967	14.6	still in milk giving 15 lb.
323	8,036	27.2	
287	7,206	40.0	
319	6,426	25.3	

Cow No. 287 in her present lactation averaged 53 lb. milk per day in December 1935.

Sind herd.—This herd continues to thrive well at Hosur. The demand for this breed of cattle is increasing and it may be advisable to increase the number of cows in the herd.

There were 40 births (21 heifers and 19 bulls) during the year, seven bulls, 11 cows and six calves were sold, three bulls, one cow and six calves died, one bull was loaned and one bull was transferred to the Agricultural College, Coimbatore, and one bull was transferred to work cattle leaving a balance of 170 at the end of the year.

There were on the average 33.7 cows in milk throughout the year and they produced 151,790.5 lb. milk. The daily average yield of milk amounted to 12.4 lb. per day per cow in milk as against 12.7 lb. last year.

In October 1935, 33 cows in milk averaged 14 lb. per day.

Amongst the cows which went dry during the year, 23 yielded over 4,000 lb. milk in a lactation. The highest yielders are—

Cow number.	Milk yield.		Daily average.
	LB.	LB.	
15	6,541	17.0	
40	6,360	16.5	
238	5,513	14.3	
33	5,725	13.1	
25	5,077	13.9	
187	5,068	13.2	

Applications for Sind cows and heifers are increasing and there is a large demand for this breed from people in towns and in Tinnevely district which I am unable to supply.

Kangayam herd.—The building up of a pure Kangayam herd by selection is being continued. It is a draught breed but at the same time efforts are being made to improve the milk yield of the cows without impairing the draught qualities of the bullock.

During the year there were 72 births (37 heifers and 35 bulls), one breeding bull was purchased and one bull was received back from the Cotton Specialist, Coimbatore.

Twenty-nine bulls, 19 cows and eight calves were sold, one young bull was auctioned, four bulls were loaned, three bulls, three cows and five calves died, two bulls were transferred to work cattle and three bulls were transferred to the Central Farm, Coimbatore, for work purposes, leaving a balance of 317 at the end of the year which includes two bulls with Cotton Specialist.

Two bulls were returned for not serving, one of these has served several outside cows since its return.

The demand for bulls of this breed has been good.

On the average there were 58.3 cows in milk throughout the year and they averaged 6.9 lb. milk per cow in milk.

Amongst the cows which have completed their lactations this year 30 have yielded over 2,000 lb. milk, one cow gave 5,471 lb. milk with a daily average of 14.7 lb.; her highest daily yield was 20.5 lb. Nine other animals yielded between 3,000 and 4,000 lb. each.

Hallikar herd.—The cows and heifers purchased last year have improved greatly and are thriving well here. The breed is not a milch one but milk recording is carried out.

At the beginning of the year there were 30 animals in the herd. During the year there were seven births, making a total of 37 animals at the end of the year.

On the average there were 6.6 cows in milk and they averaged 5 lb. milk per day per cow in milk.

Disposal of stock.—Thirty-six bulls (29 Kangayams and seven Sinds) were sold for breeding purposes. Three Kangayam bulls were issued on loan, one crossbred bull was transferred for stud purposes to the Madras Veterinary College, one Sind bull to Mangalore Veterinary Hospital and one Sind bull to the Agricultural College Dairy.

Thirty-six cows and 15 calves were sold and nine crossbred cows transferred to the Agricultural College Dairy.

Altogether 42 breeding bulls, 45 cows and 15 calves were disposed of for breeding purposes.

Several surplus Kangayam cows and calves were sold at the Tiruppur Cattle Fair.

The demand for breeding bulls has been good and it has just been possible to supply the demand. There are several enquiries for Sind cows and heifers and it may be advisable to increase this herd by 30 cows in order to distribute some good milking cows in urban districts and fulfil the demand for female stock.

There have been a few complaints this year from public bodies about some of the bulls not serving in the districts; three of these were returned to the farm for testing. One Kangayam bull from Chittoor served seven or eight outside cows quite satisfactorily and the Sind bull from Kumbakonam served two Sind cows in a short time on the farm, so it appears that it is not the fault of the bulls.

Bellary sheep.—The flock numbered 144 at the beginning of the year. There were 56 births. Eight sheep were transferred to the Government Agricultural Chemist, Coimbatore, for nutrition experiment, 16 rams, 33 ewes and eight lambs were sold and 12 animals died, leaving a balance of 123 at the end of the year.

Of the 56 lambs born, 13 were pure white, 36 white with black face and seven pure black.

Wood yield.—In April, 143 sheep yielded on the average 1 lb. 6 oz. wool each and in November, 123 sheep averaged 1 lb. 14 oz. each, the average yield per sheep for the year being 3 lb. 4 oz. The average yield of rams was 3 lb. 14 oz. and for ewes 2 lb. 15 oz.

The best wool yields for the year are—

Rams.		Ewes.	
No.	LB. OZ.	No.	LB. OZ.
No. 823	5 14	No. 1029	3 12
No. 977	5 4	No. 1025	3 12
No. 945	5 0	No. 1027	3 11

There is not much demand for our sheep and more propaganda by the Agricultural Demonstrators is necessary in the districts.

Berkshire pigs.—These are maintained at Hosur and they do well but the demand is very poor due to the high cost of transport. It may be advisable to discontinue this breeding.

During the year there were 31 births, three pigs were received from the Agricultural College, Coimbatore, 40 animals were sold and seven died, leaving a balance of 29 at the end of the year.

Poultry.—Flocks of White Leghorn, Rhode Island Red, Light Sussex and Black Minorca are maintained; also two indigenous breeds Chittagong and country (Black flesh variety) from Tellicherry.

Hatchability of the Chittagongs is very poor and this may be due to breeding from inbred stock. There is very little demand for the Chittagong and country breed and it may be advisable to replace these by two good country breeds, one of the fighting strain and the other white flesh variety from Vizagapatam and Godavari districts.

More attention to breeding from the best layers is necessary if improvement has to be made in egg yield and the Superintendent has been instructed accordingly.

On the average 335.2 birds were maintained throughout the year at Hosur. Three new White Leghorn cockerels were received from England. Seven hundred and ninety-four chicks were hatched out, there were 136 deaths, 729 birds were disposed of for breeding.

On the average 110 laying birds produced 14,642 eggs with a yearly average yield of 133.1 eggs per bird as against 144.5 eggs last year.

Five thousand two hundred and three eggs for hatching purposes and 6,189 eggs for table use were disposed of during the year.

The percentage of hatchability works out to 56.7 for the year.

The number of birds at the end of the year was 318.

The average egg record for first year birds for the various flocks for the year are—

Breed.	Number of birds.	Average egg yield.	Highest individual yield.	Lowest individual yield.
White Leghorns	9	137.5	186	92
Rhode Island Reds	12	183.0	238	138
Light Sussex	3	170.0	203	131
Black Minorcas	8	159.0	207	83
Chittagongs	4	113.0	133	93
Tellicherry	3	86.0	98	72

Egg Record—1931-1932 to 1935-36.

Breed.	Average number of eggs laid in year.				
	1931-32.	1932-33.	1933-34.	1934-35.	1935-36.
White Leghorns	(10) 152	(9) 162	(20) 150	(15) 141	(9) 137.5
Rhode Island Reds	(5) 132	(4) 154	(17) 124	(12) 167	(12) 183.0
Light Sussex	(9) 115	(9) 123	(6) 116	(12) 134	(3) 170.0
Black Minorcas	..	..	(2) 165	(14) 143	(8) 159.0
Tellicherry	(3) 101	(6) 88	(4) 73	(10) 83	(3) 86.0
Chittagongs	(3) 128	(3) 122	(4) 138	(5) 127	(4) 113.0

Figures in parentheses denote the number of birds.

The demand for birds and eggs for hatching is on the increase and in the interests of poultry breeders in the country, more funds are necessary to conduct research work for combating the fatal poultry diseases such as Pseudo-fowl-pest, etc. Outbreak of this disease wipes out flocks of poultry in one or two days and for a beginner who has sunk capital in such work, it is very serious indeed and acts as a severe set-back. This point requires careful consideration, for, unless these fatal epidemic diseases amongst poultry are overcome, poultry farming will never progress at the rate it is desired.

Birds, etc., maintained by Government at different stations.

Agricultural Research Stations.	Average number of birds maintained.	Number of eggs laid.	Chickens hatched.	Eggs sold for hatching.	Birds sold and transferred.
Hosur	335	14,641	794	5,203	729
Palur	128	2,386	271	307	229
Coimbatore ..	103	5,013	198	1,715	100
Koalpatti ..	12	513	17	5	17
Aduturai ..	132.6	4,963	67	446	32
Kalahasti ..	7	280	84	105	24
Samalkot ..	108	3,123	190	403	9
Anakapalle ..	130	2,204	630	261	377
Total ..	955.6	33,124.0	2,251.0	8,445	1,517

Premium bulls.—Grants of Rs. 90 per annum are given towards the maintenance of approved breeding bulls in the districts and Rs. 10 in prizes for the best calves born in the year to these bulls.

Thirty-five new bulls were admitted into the scheme and 32 bulls which had completed three years were removed. At the end of the year there were 140 approved bulls in the scheme. Sixty-five bulls served 3,296 cows during the year.

Breeding bulls.—The number of approved breeding bulls maintained in the Presidency is as follows:—

Premium bulls	140
Veterinary hospitals	15
Agricultural Research Stations	25
Jails	4
Loaned	6
Total ...	190

Livestock Research Station, Hosur.—The number of stock at the end of the year was 634. There were 125 births, 4 animals were purchased, 33 animals received from other stations, and 1 horse presented. Eighty-nine animals were sold, 4 issued on loan, 21 transferred to other stations and 29 died.

The rainfall for the year was 40.40 inches and this filled up all the tanks and greatly benefited the pasture lands. About 86 acres were under cultivation and 906.7 acres of grassland was mown. The estimated yield of hay this year is about 1,500 lb. per acre.

About 1,181,300 lb. green fodder were ensilaged.

There were 102 cows in milk throughout the year on the average and they yielded 329,843 lb. milk with a daily average of 8.9 lb. per cow in milk.

One hundred and ninety-one head of stock were protected against rinderpest with goat-virus and 50 by the serum simultaneous method.

Two or three cases of suspected Johnes disease are under observation and isolation.

One thousand two hundred and eighteen patients were treated in the Veterinary Hospital and nine castrations were performed by the Burdizzo method.

Publications.—Two articles for leaflets “Oestrus in cows” and “Reasons why bulls do not serve” and also my book on “Livestock of Southern India” were sent for publication.

R. W. LITTLEWOOD,
Deputy Director of Agriculture, Livestock.

(11)

ADMINISTRATION REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST, COIMBATORE, FOR THE YEAR 1935-36.

I submit my Administration Report for the year 1935-36.

I was in charge of the office of the Government Agricultural Chemist throughout the year under report.

M.R.Ry. K. S. Viswanadha Ayyar Avargal, Assistant Agricultural Chemist, retired from public service from 14th May 1935 and M.R.Ry. T. Lakshmana Rao Avargal, Assistant Agricultural Chemist, from 16th December 1935.

Consequent on the termination of the Tungabhadra Project Soil Survey Scheme on 29th February 1936, M.R.Ry. C. V. Ramaswami Ayyar Avargal, who was temporary Assistant Agricultural Chemist in that scheme, was appointed to act as Assistant Agricultural Chemist, *vice* Mr. T. Lakshmana Rao, reverting M.R.Ry. K. Govindan Nair, as upper subordinate. M.R.Ry. K. Govindan Nair acted as Assistant Agricultural Chemist, *vice* Mr. T. Lakshmana Rao, from 9th January 1936 to 29th February 1936. The services of ten upper subordinates terminated on 29th February 1936, on the completion of the work in connexion with the Tungabhadra Project Survey. The Soil Physicist, one assistant and a peon were transferred to Hagari for work on the Dry Farming Scheme, and were relieved in this office on 29th February 1936.

2. The work of my section as in previous years may be divided into (i) advisory and (ii) research. The advisory work consisted in rendering advice on matters connected with the Chemistry of soils, manures, cattle foods and fodders, irrigation waters and human foods for jails and hospitals, when called upon to do so, by the public, members of the Agricultural and other Government Departments. The work classified under research consisted in the conduct of original investigations in Soil Science, Biochemistry and Plant and Animal Nutrition. The most important piece of research, involving extensive work in the field and laboratory, was the Tungabhadra Project Soil Survey which was commenced at the end of last official year and brought to a completion during the year under report.

(i) ANALYTICAL AND ADVISORY WORK.

3. A total of 1,475 samples was received during the year, as against 1,319 in the previous year. In addition 2,095 samples were received and analysed for the Tungabhadra Project Soil Survey. Of the samples received, a total of 1,286 were analysed and disposed of. Samples from officers of the Agricultural Department amounted to 853, those from other Government Departments 140, from the United Planters' Association of Southern India 26

and from private parties 12. The remainder was connected with research being carried out at the Research Institute and other Agricultural Research Stations. The fees for analysis amounted to a total of Rs. 619 as against Rs. 262-8-0 during the previous year.

(ii) RESEARCH.

4. (a) *Soil Surveys—Tungabhadra Project Soil Survey.*—This soil survey was started last year at the instance of the Irrigation Department with the object of assessing the suitability of the project area for irrigation. The field work of the survey was started in February 1935, and completed at the end of June of the same year. The area was examined exhaustively, by means of profile pits at the rate of one pit for about every four square miles of land. The soil samples so collected were analysed at Coimbatore for their physical characters and their water relations. Special attention was paid to areas already under irrigation.

The soil survey has resulted in an accurate classification of soil types met with in the project area. It was found by this classification that the deep black soils occupy about 58 per cent of the whole area, the shallow blacks 22 per cent, the remainder of the area being red and mixed soils. The black soils had definite physical and chemical characters, being heavy clays with a fairly high concentrations of soluble salts at most horizons, while the red soils were shallow light in texture and with a low salt content.

The black soils had generally a high water-holding capacity, high base exchange capacity and a pH ranging from 8.5 to 9.5. Their permeability was low. There was no reason however to suppose that the black soils would react in an unfavourable manner to irrigation, if applied with discretion and with safeguards such as provision of suitable drainage.

The soils under irrigation since ancient days from the Tungabhadra showed no signs of deterioration or development of alkalinity, and judged by crop yields, still continue to be fertile. This is another argument in favour of the suitability of black soils of the area for irrigation with water from the Tungabhadra.

A detailed report on this investigation has been submitted.

5. *Toludur Project.*—A soil survey of the area under the Willingdon Reservoir was carried out to determine the reasons for the development of alkalinity in that area. It was seen that the irrigation water did not contain a high content of injurious salts. The soil was a heavy clay with a high water-holding capacity and hygroscopic co-efficient, and alkalinity probably developed owing to the neglect of providing drainage facilities. Green leaf to correct the physical texture and application of sulphur to neutralise the alkalinity was recommended.

A detailed report on the work has been submitted.

6. (b) *Soil Science—Other investigations—Reaction of soils.*—A comparison of the McFarlane-Pye Valve Potentiometer and hydrogen electrode, as used for the determination of the pH value of different buffer solutions, showed that the values obtained by the glass electrode agreed more or less closely with those obtained by the hydrogen electrode up to pH 9.2.

7. *Soil Moisture work—Hagari.*—It was seen that the moisture in the 3rd foot layer of soil was greatest in September (1935), when the land was fallow prior to sowing and that this condition continued till January (1936) when the 2nd and 3rd foot layers had an equal moisture content.

The correlation between the soil moisture and the growing crop is under study.

8. *Study of Physical and Chemical Properties of soil.*—It was seen that the different treatments given in the soil moisture plots produced no significant differences in either the chemical or physical properties of the soils. The cotton plots, however, showed a lower clay content owing probably to the formation of a compound particle.

9. *Soil Colloids.*—The work done last year was continued.

10. *Molasses as a fertiliser for paddy.*—Experiments reported on last year were continued and it was seen that while molasses in 5 tons/acre doses gave yields lower than the control, higher doses did not give significantly increased yields.

11. *Effluent from Activated Sludge Plant for Paddy.*—The experiment was abandoned because of unfavourable weather conditions. Paddy seedlings, from the 'effluent' plot, had a higher nitrogen content than those from the 'channel water' plot. This experiment is being repeated.

12. *Plant Nutrition.*—Investigations into the causes of stimulation of plant growth by cattle manure extracts are in progress.

13. *Animal Nutrition—Bullock maintenance work.*—This work was continued during the year with cotton seed and irungu cholam straw as the ration. The results obtained confirmed the findings of the past years that a bullock requires 100 grams of digestible protein per 1,000 lb. liveweight for maintenance purposes. The quality of protein as supplied in this ration was apparently the same as that of other concentrates and fodders.

It was observed during the course of the experiments that irungu cholam straw had about the same digestibility as that of chitrai or periamanjil cholam.

14. *Mineral metabolism of young dairy stock.*—Experiments with ten calves, showed that, on the dairy ration as now fed, the calves were at positive balance as regards CaO, and P_2O_5 and that they were getting sufficient bone-building material in their diet. There was, however, some difference between the sexes as regards their mineral requirements.

15. *Mineral metabolism of cows.*—Mineral balance experiments with six lactating cows, on the full dairy ration plus mineral mixture, showed positive balances in P_2O_5 , but slight negative balance in Ca O. The dairy ration despite its high mineral content supplemented by the mineral mixture would seem to be inadequate to meet the needs of lactating cows.

16. *Chemical diagnosis of acalcicosis.*—Preliminary work was started on a simple method of diagnosis of acalcicosis, by chemical analysis of blood serum.

17. *Sulphur feeding and wool production.*—This work was continued, but so far yielded negative results. A detailed study of sulphur metabolism in sheep has been started.

18. *Effect of manuring on crop quality.*—Studies on the composition of grasses, as grown on differentially manured plots are in progress.

19. *Biological value of proteins.*—Work was done on the biological values of two different varieties of ragi grains, using rats as experimental animals. It was seen that white ragi had a higher biological value than brown ragi.

20. *Microbiology—Physiological studies on the sulphur oxidising organism.*—These studies showed that for optimum sulphur oxidation, it is necessary to supply an adequate quantity of nitrogen in the form of ammonium sulphate or urea, and carbon in the form of sodium bicarbonate.

21. *Studies on azotobacter.*—Preliminary experiments have been started on the effect of inoculation of seed or soil with azotobacter on the yield and quality of cereal crops.

22. *Studies on bioantagonism.*—Experiments showed that the fungus aspergillus had a deterrent action on *Fusarium Moliniforme* due probably to physiological effects on the biochemical factor antagonistic to the latter. This work is in progress.

23. *Associated growth of cholam and pulse.*—Field experiments, on this problem, indicated that for optimum associated growth, a cholam pulse ratio of 3 : 1 was the best from the point of view of yield of both crops.

24. *Nodule cultures.*—Nodule cultures of soy bean, groundnut and clover were prepared and distributed to the various research stations, as and when required.

25. *Agricultural industries—Active carbon from paddy husk.*—Some modifications were carried out in the process of active carbon manufacture as developed by this section. These modifications were designed to increase the efficiency of the process and to lower the cost of the finished product.

A large quantity of active carbon was prepared for distribution to officers of the department for cream jaggery demonstrations in their circles.

26. *Active carbon from other waste materials.*—Waste materials, viz., groundnut hulls, cotton stalks, coffee husk, coconut husks, saw dust and spent avaram bark were investigated as raw materials for carbon making. Groundnut hulls appeared to be about the most promising material for making an efficient carbon; further investigations are in progress.

27. *Revivification of active carbon.*—The question of the revivification of used active carbon was investigated on the laboratory scale, and it was found that revivification could be carried out by strong heating followed by thorough washing.

28. *Clarification of other products by carbon.*—The clarification of coconut palm juice for jaggery making and of various edible oils was attempted, with some degree of success. It would appear that active carbon can be utilized on a commercial scale for the clarification of oils, at a low cost, without any deterioration in quality of those oils.

29. *Cream jaggery.*—Investigations are in progress on the prevention of development of a red colour in the juices of some varieties of cane on boiling. The bubbling through of carbon-dioxide was found to arrest the development of colour when tried on a laboratory scale. This process will be applied on a large scale, before definite conclusions are arrived at.

30. *Fundamental investigations on active carbon.*—Detailed investigations have been started on the factors involved in the activation of carbon, structure of vegetable materials used, and the effect of structure on the final product, and the physical and physico-chemical properties of active carbons. Work is in progress.

31. *Physico-chemical studies on jaggery.*—This investigation was completed during the year under report and was submitted as a thesis by an assistant in this section for the degree of M.Sc., of the Madras University. The conclusions arrived at may be stated to be, in the main, that the proportion of non-sugar-organic matter, present in the juice, had a profound influence on the quality of the jaggery.

32. *Cholam malt.*—Work was started on this problem during the year, financed by a grant from the Imperial Council of Agricultural Research.

Several varieties of malt were selected and examined for suitability for malting. Investigations were in progress on bulk malting, effect of steeping, moisture losses during couching, removal of husks of cholam, and the blending of malt meals with wheat flour for bread, biscuit and cake making.

P. VENKATARAMIAH,

Officiating Government Agricultural Chemist.

6th May 1936.

(12)

ADMINISTRATION REPORT OF THE PADDY SPECIALIST, COIMBATORE, FOR THE YEAR 1935-36.

1. *Charge and staff.*—The report deals with the work done at the Paddy Breeding Station, Coimbatore, and the rice stations at Maruteru, Pattambi and Berhampur. While I remained in charge of the section throughout the year, the sub-stations at Maruteru, Pattambi and Berhampur, were under the immediate charges of the Superintendents, Messrs. K. Venkataraman, C. R. Srinivasa Ayyangar, and Samuel Jobitharaj, respectively.

PADDY BREEDING STATION, COIMBATORE.

2. *Season.*—At Coimbatore the season was again an abnormal one, only 12 inches of rain having been received for the two monsoons. Due to the systematic treatment of the fields with green manure, the early planted bulk crops did well in spite of the adverse season and an average acre yield of 2.722 lb. grain has been recorded for the station.

3. *Seed distribution.*—Twenty-two thousand five hundred and eleven pounds of seed of strains were transferred to the Circle Officers for distribution.

4. *Economic work—Evolution of strains—(a) By selection.*—One hundred and sixty-five strains from six varieties of Tinnevely, Madura (Periyar area) and Chingleput districts were under yield trials, and 25 of the most promising ones have been taken for further trials. Two strains of *sendhinayagam*, another variety of Tinnevely, are reported to have done better than the local variety in the trials conducted in the tract.

(b) *By hybridization.*—The strains bred for *piricularia* resistance have again done remarkably better than the susceptible variety, the season being particularly favourable for the incidence of the disease. The trials with these strains at the Agricultural Research Station, Aduturai, the Agricultural Research Station, Palur, and at two centres in the third circle have all shown the superiority of strain No. 10998 which with another season's trial at a number of centres where *piricularia* is known to be present, can be released for distribution. Meanwhile even more promising strains from another cross which have reached the yield trial stage should become available. With the widespread occurrence of *piricularia* in different parts of the province, the problem of breeding for *piricularia* resistance is bound to increase in importance at all the rice stations.

The enormous possibilities of synthesising valuable economic characters by hybridization have been confirmed by the performance of Co. 3 cross progenies which at Coimbatore and at a number

of centres in the different circles have proved consistently better than Co. 3 both in yield and other characters like stronger straw and better grain. One of these strains, No. 10905, is now available to be released with a station number—the first instance of a hybrid strain produced on the research station.

Several other crosses are under various stages of study at the Paddy Breeding Station, Coimbatore, some of these are the progenies of crosses with the wild rice (*O. longistaminata*), and they are expected to possess the hardy and drought resistant characteristics of the wild rice.

(c) *By introduction*.—The introduction of varieties from outside for trial and comparison with local varieties has also met with some success. Some of the introduced Patna types have proved better than GEB. 24 in parts of eighth circle. The short duration variety *pichodi* introduced from Hyderabad some years back is increasing in popularity particularly in parts of first circle.

5. *Collection of pure lines*.—This collection has now gone over 1,200 and new ones are being continuously added to this. Among new arrivals during the year were 53 from Malaya and Burma besides a number of wild species of *Oryza* obtained from Russia, Phillippines and Africa.

6. *Fundamental studies*—(a) *Inheritance of characters*.—Definite information has been obtained during the year about the genetics of long sterile glumes, ripening black and ripening brown characters of the fertile glumes, the prostrate and floating habit of the stem, new types of chlorophyll deficiencies, male sterility, and shattering of the grain. The inheritance studies have also given interesting results of linkages between unimportant anthocyan pigment characters and economic characters like the arrangement of the grain in the panicle, the flowering duration, number of ears per plant and sterility.

(b) *Mutations*.—Several new mutations for pigment factors and for stature of plants have been isolated from hybrid progenies. Results of very great scientific interest have been obtained during the year from the study of several mutations isolated from X-rayed progenies. While the genetics of several of the mutations have become clear, others require intensive cytological studies to explain their peculiar behaviour. The close inter-relationship between genetics and cytology is particularly evident in the study of the mutations for sterility. The cyto-genetic study of the mutants and the study of the special crosses with polyploids which are in progress are expected to be of considerable help in determining linkage groups and the basic number of chromosomes in rice.

7. *Other investigations*—(a) *Grading seed*.—The experiment to determine the differences if any in the performance of seed graded according to weight from two pure lines did not lead to any definite results.

(b) *Analysis of market samples*.—In connexion with the analysis of market samples of paddies and rices from the different parts of the province, the physical analysis of 252 samples was completed. The cooking tests were conducted for 42 of these samples. A simple laboratory method of carrying out cooking tests with rices was evolved for adoption in all the provinces where the work is undertaken.

(c) *Storage experiments*.—Experiments conducted with different methods of aerating stored grain would appear to show that where the storing receptacle is provided with bottom ventilation the stored product shows better cooking values than the one where there was no provision for passage of air. Harvested grain kept in a refrigerator is found to retain all the bad cooking qualities of fresh rice even after the lapse of some time showing that there has been no post-harvest ripening of the grain during storage.

(d) *Quality in rice*.—That rices vary in their thickness of bran layers, an observation made in Coimbatore some years ago, has been confirmed by the chemical investigation on the quality of rice in progress at Bangalore. Materials from different rices like early and late duration, white and coloured, dry and puddled, hard and soft, etc., have been fixed at various stages of grain development for the study of the formation of the bran layer. The same rices have been sent to the Bio-chemist, Bangalore, for undertaking chemical investigations on them. In the histological studies of rice grain, some information has been obtained about the time and development of starch formation in the different parts, the endosperm, the embryo and the bran layer.

(e) *Hybrid vigour*.—Studies on hybrid vigour have indicated that there may be no connexion between such vigour and embryo size in rice. When the two parents involved in a cross vary markedly in grain size, the reciprocal F_1 s do show hybrid vigour but the one obtained with the smaller grain parent as the mother shows comparatively less vigour than its reciprocal. In crosses where the two parents are equal in grain size, the hybrid seed itself is not in any way different from the selfed seed unlike in the case where the parents differed in grain size. Observations on the sequence of tiller formation, flower anthesis and the weight of individual grains show that there is no difference in grain size among the first three to four tillers of the plant and among the grains formed in the first few days of the flower anthesis.

(f) *Root studies*.—The continuation of root studies in rice during the year has shown: (1) the number of roots formed per plant is highly correlated ($r = +0.9 \pm 0.1$) to the number of tillers produced by the plant; (2) the number of roots per plant shows a fall as the number of tillers start dying off in medium duration varieties (5 months) whereas in a late variety (6 months) the root activity continues even after the reduction in tillering has commenced; and (3) in varieties of similar duration but differing in height, the taller growing varieties show a more extensive root system than the shorter ones.

(g) *Vernalization*.—Rice seeds vernalized in darkness for a period of 20 days gave rise to plants which came into flower five days earlier than those from non-treated seeds.

8. *Agronomic studies*—(a) *Cultural experiments*.—While transplanting, except in special tracts, is generally found to be better than broadcasting, experiments at the Paddy Breeding Station, Coimbatore, have shown that dibbling the seed in lines in puddle can be just as good as transplanting. While these trials will be continued attempts are being made with the help of the Agricultural Research Engineer to design a simple drilling machine that can be used in the puddled fields. For Berhampur conditions, broadcasting has once again proved to be just as good as transplanting and the optimum seed rate for broadcasting is between 40 to 60 lb. per acre.

The spacing experiments at the Agricultural Research Station, Maruteru, have again shown the advantage of planting the seedlings closer in the lines and having the lines wider apart. The optimum spacing for Pattambi and Berhampur conditions has been found to be within six inches. An experiment combining spacing, planting singles and doubles and manuring or no manuring of the transplant field conducted at Berhampur has shown that there is no difference between singles and doubles and the closer spaced seedlings respond better to manurial treatment in the transplant field.

With regard to age of seedlings no differences were noticeable among ages 30 to 60 days at Pattambi, so long as the planting was done within the normal season, while for planting out of the season the age of the seedling must be less than 50 days. The optimum age of seedlings for Berhampur conditions is between 30 to 40 days. At Maruteru, the advantage of early ages of 20 to 30 days is bound up with the thin sowing of the nursery and in fertilising the seed-beds, whereas for older seedlings of ages, 40 to 50 days, manuring of the seed-bed is of no advantage.

The double transplanting trials in progress at Maruteru would appear to show that the treatment is advantageous only in certain seasons and for particular varieties.

(b) *Manurial experiments*.—Previous experiments at Coimbatore, Berhampur, Maruteru and Pattambi had given information that the manuring of the transplant field had a better effect on the development of the plant and final yield than the manuring of the seed-bed. During the year the experiment was modified by planting out the well manured seedlings earlier. Even then the advantage of manuring the seed-bed is not apparent both at Coimbatore and at Berhampur. The application of either phosphates (super) or a compound fertiliser (ammophos) to seed-bed tried at Coimbatore and Berhampur has shown no advantage in such treatments.

Various manurial experiments involving N and P_2O_5 ratios, different forms of phosphatic manures, different quantities of green leaf, and applications of fertilizers over green manuring have been in progress at Berhampur and Pattambi. The results obtained may be summarized as follows: (1) There is generally no response to phosphatic fertilizers applied in whatever form; (2) green manuring is definitely better than mineral fertilizers to supply the same amount of N under Pattambi conditions; (3) application of nitrogenous fertilizers over a basal dressing of green leaves definitely gives an increased yield under Berhampur conditions; (4) the yield increases are progressive with increased doses of green leaf from two thousand to ten thousand pounds per acre in Berhampur and the heavy leaf doses have a definite residual effect.

The application of lime to rice soils under trial at Berhampur and Pattambi has shown that there is no response to it at Berhampur while there is a slight effect at Pattambi.

The subsidized manurial trial with the second crop conducted at Maruteru has indicated the following points: (1) The beneficial economic dose of N and P_2O_5 is 32 lb. of each per acre applied either as a compound fertilizer (ammophos) or as a mixture of ammoniumsulphate and super; (2) there is no difference between milled guano or flower phosphate as a P_2O_5 supplier over the application of groundnut cake; (3) P_2O_5 by itself gives no response; and (4) there is no residual effect of any of the manures, organic or inorganic, given to the second crop on the yield of the succeeding main crop.

At the suggestion of the Imperial Council of Agricultural Research, the findings of Prof. Dastur were put to test in all the rice stations. Thirty pounds of N was given both as ammonium sulphate and as sodium nitrate singly and in combinations of the two in varying proportions. The results obtained are all alike in that ammoniacal nitrogen is better than nitrate nitrogen and a portion, up to half of the ammoniacal nitrogen can be replaced by nitrate nitrogen without affecting the yields.

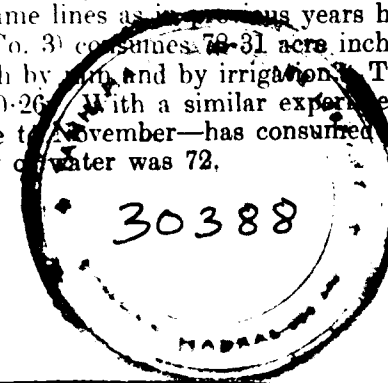
9. *Economics of rice growing*.—The net profits per acre from rice cultivation adopting all the improvements advocated by the department obtained from the demonstration areas in each station for which cultivation sheets are maintained are Rs. 77 for Coimbatore (single crop), Rs. 77 for Maruteru (two crops) and Rs. 88 for Pattambi (two crops). The above figures do not include land assessment and water-rates.

10. *Irrigation experiments*.—The experiment continued at the Paddy Breeding Station on the same lines as in previous years has shown that a five months' crop (Co. 3) consumes 72-81 acre inches of water including the supply both by rain and by irrigation. The duty of water for the year was 50-26. With a similar experiment at Maruteru the main crop—June to November—has consumed 54 acre inches of water and the duty of water was 72.

R

J. 211 x N35

N36



11. *Other crops*.—The Solanaceous plant of tomato, chillies and brinjals were grown as usual on a small scale and in certain inter-varietal crosses in chillies, information about the inheritance of pungency, size and shape of fruit, thickness of flesh and number of seeds per fruit is being gathered.

The sunnhemp selections have been handed over to the Cotton Specialist for multiplication in his station as the crop sown in the Paddy Breeding Station invariably gets subject to a serious attack of insect pests.

Among the new crops tried at the Paddy Breeding Station during the year may be mentioned the new green manure crop (*Scsbania speciosa*) sent by Mr. H. C. Sampson from Africa. The crop promises to prove an excellent green manure crop for Madras in that it grows more luxuriantly than the ordinary daincha and at the same time possesses soft and succulent stalks like sunnhemp. The crop is being multiplied.

AGRICULTURAL RESEARCH STATION, MARUTERU.

12. *Season and yield*.—The total rainfall of 33.53 inches was both deficient and badly distributed. The outturn for the entire station averaged only to 2,713 lb. per acre.

13. *Seed distribution*.—Fifty-three thousand seven hundred and eighty pounds of seed were distributed both directly and through Circle Officers. Besides paddy, 3,300 lb. of sugarcane setts, 109 plantain suckers and 75 pine apple suckers were also distributed.

14. *Economic work*.—Ten strains of the first crop varieties were under district trial at several centres in Kistna and Guntur districts. Of this one strain of *atragada* and one strain of *konamani* have done well in both the districts while a strain from *vanki-sannam* did not prove any better than the strain Mtu. 8 already under distribution. One hundred and twenty-two apparently pure families from hybrids were put to preliminary yield tests during the year and the best of these will be subjected to further trials.

15. *Other crops*.—With the object of judging the relative drought resistance, five varieties of sugarcane (Co. 213, 241, 281, 290 and P.O.J. 2878) were grown in dry lands with only two irrigations, one at planting time and the second a fortnight later. The outturns disclosed that P.O.J. 2878 withstood the drought conditions admirably and 39.39 tons of cane to the acre have been recorded.

Twelve varieties of cotton were tried in single-crop lands, the sowing being done in three batches, middle of November, end of November and middle of December. The November-sown crops yielded fair outturns while the December crop was a failure. Among the varieties tried *buradapathi*, *uppam*, Co. 2 and *Uganda* Bk. appear to be the most promising.

The trial of planting plantain suckers in singles and in twos was laid out with three varieties and the final results are not yet ready and so also a comparative yield trial with three local varieties of plantain.

16. The light trap campaign against paddy stem-borer moth was continued. January was again found to be the peak month of catch in agreement with results recorded previously.

AGRICULTURAL RESEARCH STATION, PATTAMBI.

17. *Season and yield*.—The total rainfall of 78.79 inches in 120 days was short of the general average by 25 inches. While the first crop suffered for want of sufficient water, the second crop suffered from both water deficiency and insect attack.

18. *Seed distribution*.—Thirty-eight thousand four hundred and two pounds of seed were distributed during the year from the station, mostly to Circle Officers and to a small extent to the neighbouring cultivators.

19. *Economic work*.—Four strains from varieties, *parambu pattan*, *thavalakkannan* red rice and white rice and *thekkancheera* respectively which have shown a consistent increase of 13.0, 16.9, 13.6 and 10 per cent respectively over the ryots' seed are being released this year with the station numbers Ptb. 7 to 10. Sixty-three strains of other varieties were under various stages of yield trial during the season. Seven hundred and seventy-nine new single plant selections isolated from five varieties, four of South Kanara and one of Malabar were under study.

20. *Other crops*.—Ragi offers itself as a suitable crop for dry lands to be grown during the monsoon season.

Among the cotton varieties tried, *nadam* of Coimbatore, *podu-pathi*, *buradapathi* and *tellapathi* of Vizagapatam have given encouraging results.

Pineapple has shown itself to be the most remunerative crop for dry lands, a net profit of Rs. 343 per acre having been realized from it in the course of 33 months as against a normal income of Rs. 30 on similar land by growing paddy, *samai* and gingelly.

The results of the monthwar planting of sugarcane varieties indicate the advisability of starting the crop early in the season. Of the thick cane types so far tried, Co. 408 is quite promising in single crop lands. It is able to withstand drought conditions in early stages better than other varieties. For the first time canes have been grown successfully in the double crop wet lands. It was possible to germinate the crop successfully with the help of moisture present in the land after the harvest of paddy.

Guinea grass planted for the first time in dry lands has stood the summer conditions well. Twenty-six thousand three hundred and eighty-eight pounds of silage was prepared during the year from the grasses cut from the bunds and vacant spaces.

RICE RESEARCH STATION, BERHAMPUR.

21. *Season and yield*.—The total rainfall for the year was deficient by about 14 inches from the 10 years' average. No crop of rice was raised in certain parts of the district for want of sufficient rain. An average yield of 2,000 lb. per acre was recorded for the station.

22. *Seed distribution*.—Fifteen thousand pounds of mass selected bulk seed from two varieties *ratnachudi* and *bayyahunda* were distributed from the station.

23. *Economic work*.—Eighty-two strains from the five most important varieties of the tract were under yield trials for the second time and a good number of these have recorded increases of 15 to 20 per cent over the control. Besides the above, 75 strains from yet another variety and 823 selections from some of the finer rices for which this tract is famous were under preliminary stages of trial.

24. *Hybridization*.—The hybridization work intended to throw light on the inheritance of certain characters still obscure has given some interesting results. The relationship of the different rice colours, red, light red, and white is now intelligible and it would appear they all belong to multiple allelomorphic series. Certain crosses made for the inheritance of grain hardness and some crosses with wild rices are in the preliminary stages of study.

25. *Other crops*.—The only crop tried on a small scale is sugarcane of which Co. 213 gave a 25-ton crop. Raising of green manure crops like indigo and wild indigo is becoming a routine, their beneficial effects on rice being very striking.

MISCELLANEOUS.

26. *Special lectures*.—The final year students were given a demonstration of the material grown in the Paddy Breeding Station, on two mornings and were later given two special lectures on Rice Genetics.

27. *Research Council*.—As the President of the Institute Research Council for the year, I presided over its meetings when the progress reports of research schemes were discussed. A five years' programme of work for rice improvement in Madras was written up and submitted for use by the newly constituted Provincial Research Council.

28. *Imperial Council of Agricultural Research*.—As a member of standing Rice Committee, I attended the meeting of the rice research sub-committee in Delhi during February when the progress reports of the rice schemes in the different provinces were discussed.

29. *Special tour*.—The Imperial Council of Agricultural Research agreeing to meet my tour charges, I was allowed to visit Burma for three weeks in November 1935 to study the conditions

of rice growing there. Several new types of rice that appeared worthy of trial in Madras were marked and samples of these have since been obtained.

30. *Exhibitions*.—Besides sending charts and specimens to the Circle Officers for use in local exhibitions in the districts, a comprehensive exhibition showing the activities of the section was put up at Coimbatore during the College Day celebrations in August 1935.

31. *Publications*.—The writing of the 'Hand Book on Rice in Madras' was finished during the year and is now in press. Ten scientific papers and six notes dealing with either the genetics or the agronomy of rice were either published or sent for publication during the year from Coimbatore.

K. RAMIAH,
Paddy Specialist.

28th April 1936.

ADMINISTRATION REPORT OF THE COTTON SPECIALIST FOR THE YEAR 1935-36.

Charge.—I continue to be in charge of the section throughout the year except for a brief period from 3rd to 14th January 1936 when Dr. Kasinatha Ayyar was in charge of the current duties.

Staff.—M.R.Ry. P. N. Krishna Ayyar was appointed as Parasitologist in the Madras Pempheres and Physiological Scheme from 5th October 1935. M.R.Ry. R. Balasubramania Ayyar was promoted as Gazetted Assistant in the Madras Herbaceum Scheme from 2nd January 1936.

COTTON BREEDING STATION.

(a) *Season.*—Severe drought was experienced for another year in succession. The annual rainfall was 11 inches below the average. Both the monsoons turned out to be weak and untimely. Rainfed cholams were sown late and were subjected to fairly long intermittent dry spells. Cottons were hit badly by the shortage of soil moisture. Bengal grams had a setback in growth as a result of the failure of morning dew and a severe infestation of pod borers. In general the season should be termed agriculturally very unfavourable.

(b) *Cotton breeding.*—Yield trials of the three new Cambodia strains conducted last year in the districts pointed out that two of them, viz., 920 and 1267 were better than Co. 2 in 5 out of 8 trials. They were grown for seed multiplication under ryots' conditions. It is gratifying to note that they are favourably reported upon.

Four of the derivatives from crosses between Co. 2 and South African cottons were raised in plotscale near the Anamalais. They were found to be earlier by one month than Co. 2 with the latter's productivity. If only similar results could be had in the years to come, they would be very helpful for the observance of a close period between two successive cotton crops.

A large number of selections were continued to be tested in progeny rows with the object of isolating better yielders.

Strain Co. 2 was crossed and back-crossed with Hawaiian, Egyptian, Sea Island and South American cottons with the idea of improving resistance to drought, staple length and fineness. Their progenies are under study.

(c) *Cotton Agronomy.*—Investigations on the effect of growing cholam mixed with pulse on the succeeding cotton were continued. Among the several combinations tried, the best with regard to grain weight was 3 cholam : 1 legume treatment. Among the pulses compared, clusterbeans and greengram withstood better the

crowding and the interference of the cholam crop. When Cambodia cotton was raised on them, the differences between the treatments were not significant except in the case of pure greengram and redgram plots, where the yields were surprisingly the lowest. It was clear that the growing of certain legumes in association with cholam did not confer any beneficial effect on the succeeding cotton.

A new irrigation experiment was designed and carried out during the year with a view to determine the best time for the application of water to Cambodia cotton. The results tended to show that good crops could be raised with only two irrigations applied after the cessation of the north-east monsoon and that the best period for irrigation would be about the second weeks of December and January. A study of the soil moisture contents in some of these plots indicated that under the climatic and soil conditions obtaining at the Cotton Breeding Station, a 2-acre inch irrigation which is approximately the quantity supplied during a normal irrigation, affected mainly the moisture levels in the first foot, and arrested the normal loss of moisture in the second and third foot horizons. It was further observed that the effect of one irrigation lasted up to four weeks in the months of December and January.

Experiments on the effects of intercultivation with bullock hoes were repeated on a field prepared with country plough. The data pointed out that the change in the preparatory cultivation did not bring about any alteration in the efficacy of intercultivation but on the other hand, frequent cultivations with bullock hoes tended sometimes to lower the yields.

(d) *Other studies in cotton.*—Further studies on the age of leaves revealed that leaf age is correlated with the rate of transport of nitrogen *ex* leaf, and that if by any means the movement is curtailed, the leaves remain longer on the plant. Investigations on the inheritance of characters gave some interesting and useful results. Deeper shades of pollen colour were found to be controlled by an intensifying factor which is operative only in the presence of the factor for red petal colour. Normal condition was found to be dominant to novel features like increase in the number of meristic parts, chlorophyll deficiency, intermittent fusion of vascular bundles in the carpel, and hairlessness of the leaf. Germination of seeds planted singly was improved by sowing seeds like groundnut, bengalgram and lab-lab along with those of cotton in the same hole and by covering them with wet sand.

(e) *Study of other crops—Redgram.*—(1) Many cultures were grown in progeny rows for the study of earliness, prolificity and big seeds. The derivatives from Bangalore $\times$ local types were more hopeful. All the available varieties were tested for their cooking qualities and sorted out on that basis.

(2) *Bengalgram*.—Three strains were distributed in the districts for the comparison of their performances. They were reported to be better than locals on the Central Farm, Udumalpet, Dharmapuri and Northern Circars.

More than 2,000 cultures were tested in rows for their purity in morphological characters and yield. The results were much vitiated by the attack of the stem borer.

Very useful and interesting data were gathered during the year with regard to the inheritance of seed colour, shape and surface.

The importance of the problem of improving the yields of these two pulses will be evident from the fact that the value of imports under these two pulses alone exceeds 140 lakhs of rupees.

Improvement of cotton in other tracts.—Varietal trials were conducted on the *poonam* lands at two places in the Malabar district. They indicated that karunganni 546 would be the most likely substitute to replace the coarse short stapled cottons grown on these lands. Arrangements have been made with the Deputy Director of Agriculture, VII Circle, to distribute 150 lb. of karunganni seeds during the coming year for making observations on bulk scale.

Attempts to improve the short stapled mungari cottons of the Bellary district were also set on foot. A number of long stapled strains evolved by the breeders in the Central Provinces and Hyderabad State were imported and tested in comparative trials with the local mungari. None of them was found to excel the latter in yield. A second trial with most promising of the lot has been arranged at six centres for the coming season.

Detailed analyses of the fibre properties of the several samples of Northern cotton collected last year revealed that *herbaccum* and hybrid plants possessed shorter and coarser lint than *indicum* and that the deterioration reported in the Northern might have been brought about by their being the major constituent in the cottons grown there at present.

Besides, a number of fine linted types got from Nagpur and Dharwar were compared with H₁ and N₁₁ at Nandyal and Tadpatri. Their results would be reported upon by the Deputy Director of Agriculture, III Circle.

OTHER AGRICULTURAL SCHEMES.

The Indian Central Cotton Committee continued to render financial assistance to four schemes working under my charge :

(a) *Madras Herbaceum Scheme*.—This is the sixth year since the commencement of work on hybridization. The new strain which during last season surpassed the yield of standard karunganni strain was tried at three places in the districts. It is gratifying to note that it turned out to be better than karunganni and upparam in two of them in spite of long droughts and untimely rains, and

was declared by the Director, Technological Laboratory, to be capable of spinning as well as karunganni. But its narrow leaf is a disadvantage since many mistake it for the short stapled, coarse *Roscum* cotton. Attempts are therefore made to multiply the seeds of the broad lobed mutants frequently met with in this type. It is confidently hoped that it will go a great way in accomplishing the object of the scheme and to replace the coarse upparam.

Six strains including the two that were tried last season were again compared for yield. Three of them were found to be distinctly superior. A large number of cultures were tried in randomised replicated rows. Many gave signs of surpassing the control in lint length, fineness and yield.

(b) *Madras Pemphores and Physiological Scheme*.—It is in the fifth year of its running. Experiments for the estimation of the loss in yield caused by the attack of the stem weevil were conducted in three varieties. It was rather surprising to find greater mortality in the indigenous cottons than in the Americans when grown under similar conditions. It was again experienced that the mere act of burrowing into the stems curtailed the physiological activities of the plant with the result the non-infested recorded higher yields than the attacked in Co. 2 and karunganni, the latter showing higher losses due to lower degree of resistance. The external evidence of resistance consisted in the formation of galls covering up the injury and in the production of a gum checking the progress of the insect. Studies of the latter process disclosed that the gum was pathological in origin. A number of organisms have already been isolated which have been found capable of producing gums under artificial conditions. Evidence of a fairly close association between the extent of water soluble polysaccharide contents in the stem and the readiness of the plant to produce gum to control the onward march of the grub has also been obtained. If only this association is found true in all varieties, the evolution of a resistant type will be rendered considerably easier and more precise.

An exhaustive survey of the Sattur-Srivilliputhur belt with regard to the distribution of the weevil has yielded confirmative evidence of the efficacy of the properly observed 'no cotton' period. The cause that accounts for the negligible incidence of the pest in Sattur and its vicinity seems to be the natural observance of a 'no cotton period' for three to four months. On the other hand the growing of Cambodia from February to October and of country and Cambodia cottons from October to April with no close period has been very helpful for the multiplication and the continued presence of the insect throughout the year in the Srivilliputhur area.

A reconnaissance survey of all the important cotton tracts was made by the Parasitologist with the object of searching for parasites and predators. *Pemphores* has been found to be fairly abundant as a pest of cotton in portions of Ramnad, Coimbatore and Tinnevely districts and as a pest of *Bendai* in the Malabar

district. Weevils were found to be parasitised only to the extent of 4.7 per cent. Out of the four species of parasites indentified so far, the Braconid would appear to be very efficient. It has been found in nature in larger numbers and is capable of destroying more hosts by stinging than by ovipositing. It can be easily bred in the laboratory and has two alternate hosts in *amaranthus* weevil and powder post beetle which can be used for rearing them when *pempheres* grubs are not available. Attempts are on foot to multiply this parasite in large numbers for liberation in the new crop to be grown next season.

Breeding experiments have shown that by carefully planned backcrossing methods it would be possible to evolve types possessing the resistant behaviour of the South American cottons with the earliness of Co. 2. Advantage has been taken of the Masi-pattam sowings in Srivilliputhur to raise two generations in a year and thus speed up the breeding work.

Work on the bud and boll shedding of cotton was continued at Koilpatti. All the available material was explored in search of selections that would shed least under the influence of February rains. Their progenies were studied with reference to this characteristic. Some of them were given an irrigation in February with the idea of studying their relative response. It was gratifying to note that a few selections not only recorded a low shedding index but also took advantage of the February irrigation to improve their yield. It has to be investigated however whether the above behaviour is brought about either by the interaction between the time of application of water and the stage of development of the plant or by genetical influences.

(c) *Madras fodder cholam scheme* has passed through the fifth year of its life. As in previous years all the agronomic experiments were conducted at Koilpatti, while the chemical aspect was studied at Coimbatore. Due to the failure of the monsoon, many of the trials gave inconclusive results. Experiments on spacing, manuring, growing cholam in association with pulses, raising crops like coriander, blackgram, horsegram and onions in cotton, and on the artificial prevention of seed setting by measures like thick sowing, late sowing, harvesting at shot blade were continued. The differences between treatments were not significant in most of the cases.

The studies on base exchange in soil were pursued on a more comprehensive scale. The data were in line with last year's, confirming thereby that Sodium-ions increased in quantity as a result of cropping the soil with cholam.

Based on the information secured last year with regard to the nature of the soil colloids, a few new lines of work were conducted during the year. Chemical correctives for soil alkalinity like magnesite, sulphur, gypsum were applied to plots that were under cholam last year. Magnesite stimulated a good response but the difference was not high enough to be significant. In some plots,

cotton was raised without any preparatory cultivation after the cholam crop. Marked increase in the yield of kapas was obtained from such plots, lending support to the deduction that the depressed yields noticed in cholam plots are consequent on the increased alkalinity caused by cholam cropping and this feature can be corrected by neutralizing the cause or its effect.

A preliminary study of soil profiles in the cultivated and virgin land near Koilpatti indicated a movement of clay *enmasse*, the extent of movement being determined by the nature of cropping.

(d) *Madras Nadam Breeding Scheme*.—This is the third year of working of the scheme. As in previous years, a new area of 10 acres was leased out at Perundurai for the conduct of the experiments. July sowings were given up once for all as they did not allow sufficient close period between two cotton crops. All the hopeful cultures in the nadam × karunganni, Cambodia × South African types were sown in replicated rows in October soon after the break of the north-east monsoon. It is pleasing to note that in many of the exotic cultures, the pickings were completed before the end of March assuring thereby the practicability of raising a cotton crop with the rains of the north-east monsoon.

The above inference was also confirmed by the results obtained from some of exotic cottons grown on plot-scale. In these trials an average yield of 232 lb. of kapas per acre was recorded, which can be considered as satisfactory when compared with those got in Nadam cumbu mixtures.

A spacing experiment was carried out in rainfed Co. 2. It was observed that a spacing of 1½ feet between, and 9 inches along, the rows would be the optimum for light porous soils.

Indications were also obtained to the effect that control of soil erosion and application of ammonium sulphate would go a great way in improving the productivity of these soils.

GENERAL.

I attended the Pest Act Conference convened by the Hon'ble Minister for Development for the consideration of the removal of the exemption granted to certain villages in Pollachi taluk with regard to the enforcement of Cotton Pest Act. I also attended one meeting of the Indian Central Cotton Committee at Bombay.

I availed of the permission granted by the Indian Central Cotton Committee to visit the important cotton breeding stations in other parts of India.

I acted as Secretary to the Research Council for a year and delivered two special lectures to the final year students on cotton breeding.

11th May 1936.

V. RAMANATHAN,
Cotton Specialist.

ADMINISTRATION REPORT OF THE MILLETS SPECIALIST FOR THE YEAR 1935-36.

I submit herewith my administration report for the year 1935-36.

2. *Charge*.—I was in charge of the office of the Millets Specialist and of the Millets Breeding Station throughout the year.

3. *Tours*.—I was on tour for 49 days in the year. Eight assistants were on tour for a total period of 80 days and 5 field-men for a total period of 40 days.

4. *Staff*.—Assistant, Mr. V. Panduranga Rao, was selected by the Madras Services Commission for appointment as Assistant Physiologist in the Dry Farming Scheme at Hagari. He was relieved on the 20th September.

Senior assistant, Mr. P. Krishna Rao, returned to duty on 1st November after completing his two years post-graduate study at Pusa.

Assistants, Messrs. K. Narayanan Nayar and R. Guruswami Nayudu were transferred to the VIII and IV Circles respectively. Messrs. A. Mariakulandai and R. Subbiah Pillai joined the section as assistants.

5. *Millets work at outstations*.—The work of the Millets Assistants for the Bellary, Kurnool, Guntur and Tinnevely areas will be found in the reports of the respective Circle Officers.

6. *The Millets Breeding Station*.—The total rainfall of this year is the lowest on record since the inception of the station, being 4 inches lower than the 18 inches of 1928. It is about half the 12 years' average at the Millets Breeding Station. The deficiency was in all the three seasons of the year so that drought conditions were prevailing throughout with the result that there was a serious setback to dry crops. The cropping under irrigation was increased. Even this had its limitations owing to the low water levels in the station wells.

A bird proof plant house in reinforced cement concrete was constructed at a cost of Rs. 354.

As desired by the Public Works Department the continuation of further work on the new well was begun with the help of the Estate Civil Engineer. He prepared a revised estimate for Rs. 16,000 to complete the well. As the total cost of the well when completed would come up to the prohibitive amount of Rs. 17,600, the Executive Engineer was consulted about the possibility of bringing down the estimate to a maximum of Rs. 10,000. He found it was impossible to reduce the cost. To proceed with

the construction of the well involving a heavy expenditure was considered undesirable, and it was, therefore, thought that the present excavation, with its good springs, could be treated as a pond for the emergency watering of precious plants near it. Proposals along these lines were submitted.

7. *Cholam (Andropogon Sorghum, Brot.)—Economic*.—At the Millets Breeding Station, about 1,460 units of this great millet were handled during the year in both the summer and main seasons for economic as well as scientific studies. There were three series of comparative trials in summer in each of which four strains were compared in randomised blocks repeated six times.

In the (white) *Chitrai vellai* series, the standard A.S. 1575, though shorter in duration by 10 days was easily the best in grain yield. Strain A.S. 732 was significantly superior in grain yield to M.S. 3154, the Central Farm bulk seed. In the (white) *Vellai cholam* series A.S. 2095 has proved for a second time superior to A.S. 367. This strain has been given out in the Chittoor area to replace A.S. 367 that is already popular there. A.S. 2095 is reported to have done well at Kovilpatti also. In the (yellow) *Chinna manjal* series A.S. No. 809 continued to be the best, being significantly superior to M.S. 3155, the Central Farm bulk-seed. From the summer preliminary yield trial plots 7 white *cholam* strains and 2 yellow *cholam* strains were carried forward for comparative trials. Of these 3 whites and 1 yellow have been included in the summer crop of 1936.

In the main season owing to the failure of timely rains the setting of grain was poor. The comparative trials in *Peria manjal cholam* will be repeated next year. This is the second year in which seasonal factors made it impossible to proceed with yield trials under rainfed conditions—one of the serious disabilities the millet worker has to face. One hundred new selections were raised under irrigation and of these 10 have been picked for yield trials.

Bulk grains of the American varieties, Chiltex and Feterita, were raised and supplied to the Chemist for malting. From the wide varietal collections, 21 further samples were sent for preliminary tests. The chemist found six of these promising, and larger quantities of seed of these will be raised and supplied for bulk tests.

Irungu cholam sent to Rhodesia has proved a great success. It is reported as being an excellent trap crop for striga, in addition to giving heavier cuts of fodder than local varieties.

Scientific.—More knowledge on the characters and their inheritance in this great millet was gained during the year. The inheritance of some characters in crosses between the American varieties, Milo and Kafir, and Milo and *Chinna manjal cholam*, was pursued. The following experiences were met with.

The margins of leaf blades are wavy in Milo and straight in Kafir. The wavy margin of Milo was observed to behave as a simple dominant to the straight margins of Kafir.

In Milo the leaf margins dry up. This character was found to behave as a simple dominant to the non-drying condition of Kafir leaf blades. The specialized triangular tissue at the junction of the leaf sheath and leaf blade is corrugated in Milo. This corrugated junction behaved as a simple recessive to the smooth junction of Kafir.

In grain shape the umbonate grain of Kafir behaved as a simple dominant to the rounded grain of Milo.

The purple subule in the awns of Milo proved a simple dominant to the colourless subule of *Chinna manjal cholam*.

Pollen grains devoid of contents are usually present in varying proportions in all sorghums. Instances have been met with in both sorghums and *Pennisetum (cumbu)* in which non-dehiscence of anthers proved to be due to an extreme paucity of this dummy pollen.

The sorghum spikelets are normally single seeded. There are a few varieties with two seeds in a spikelet (e.g., *Dho-dhanya*). Three to six seeds in a spikelet were observed in a variety from Bihar. This phenomenon is very rare. This extra fertility in the third glume of the spikelet was found to be a simple dominant to the normal single seeded condition.

There are two kinds of spikelets in the sorghum panicle, one sessile and hermaphrodite, developing the grain, and the other, pedicelled and usually barren. Each sessile spikelet will have one or two pedicelled spikelets attached to it. In three varieties, two from Africa and one from Bihar these pedicelled spikelets were observed to be fertile.

8. *Cumbu (Pennisetum typhoides, Stapf. and Hubbard)*—*Economic*.—Over 250 units of this millet were sown both as a summer and as a rainfed crop. One series of comparative trial with three mass selected irrigated varieties in the summer season and two series of comparative trials with rainfed varieties in the main season were carried out. P.T. 504 and M.S. (P.T.) 1546 were outstandingly good giving a 25 per cent increase over the standard. Another year's trial will show if this superiority is maintained.

Of the three irrigated varieties, seeds of M.S. (P.T.) 2229 are being put out in the districts, and of the rainfed varieties P.T. 248, a strain of the local *Kattu cumbu*, has been chosen for multiplication and distribution.

The Jamnagar Giant variety was introduced from the Nawar-nagar State. It has very long heads. Its economic possibilities under rainfed and irrigated conditions are being explored.

There is a demand for the Punjab cumbu with its long ear-heads. Selections have been taken to provide good seed.

Scientific.—The details of the tillering habit of this millet were studied with a view to assay the economics of this equipment. The charting of several plants showed five kinds of tillers, viz.,

(1) main stalk, (2) primary tiller, (3) secondary branch, (4) tertiary branch, and (5) quaternary branch. On an average the main stalk of a plant consisted of nine internodes above the ground level and the distribution of their lengths was characterised by a progressive increase up to the sixth internode, a slight decrease in the seventh and eighth, and a maximum increase in the last one—the peduncle.

A first output of primary tillers and a second gush of secondary branches with their earheads of decreasing size ensure a many noded, and therefore many leaved condition and admirably fits this millet as a cereal for areas of precarious rainfall and sandy soils. The sequence of flowering of the primaries was from the lower (i.e., older) ones upward, whereas in the secondaries this order was usually reversed, i.e., the top ones flowering earlier than those below.

In the above respects both rainfed and irrigated varieties were essentially the same except that in the latter there was a comparatively less incidence of secondary heads and a total absence of tertiary branches.

An evaluation of the number and grain yield of these various classes of tiller heads showed that in the rainfed varieties the secondary heads made substantial contributions, the primary heads following next, whereas in the irrigated varieties the primary heads made the major contribution followed by the main heads.

In point of sprouting energy, seeds from the various kinds of heads were the same, but in size, those of the main heads were the biggest, and of the tertiaries the smallest.

9. *Ragi (Eleusine coracana, Gaertn.)—Economic*.—Over 800 units of *ragi* were grown in two seasons. These include four series of comparative trials which were laid out in randomised blocks.

E.C. 593 continued to be the best *ragi* strain. About 5,500 lb. of this seed was distributed from the Millets Breeding Station as against the 4,000 lb. of last year and 2,500 lb. of the year before. E.C. 1507, a new short duration strain has been given out for trial in the Chingleput and South Arcot districts. E.C. 3030 a medium duration strain (a mutant from E.C. 593) is promising for areas requiring a good yielding variety, shorter in duration than E.C. 593.

Some of the types isolated from the cross between a long and a short duration variety are promising, judged from preliminary yield tests. These will be put to regular comparative trials next year.

The results of the time of sowing experiment conducted from June 1930 to September 1932 were analysed. The best sowing time in the main season for E.C. 1000, a strain of three-and-half months duration is June and in the summer season there is nothing to choose between the months January to April. For E.C. 24, a

strain later by about a month in duration, June and July are equally good months for sowing in the main season. For a summer crop, this long duration variety can be sown from January to April.

The effect of seasonal conditions is most pronounced over straw, root, grain yield and tillering capacity. Those characters which are very susceptible to seasonal conditions in the early variety are also the characters which vary most in the late variety.

The effect of season on the following characters has a corresponding effect on grain yield:—(1) the number of leaves, (2) the number of nodes, (3) the height of plant, (4) length of flag, (5) width of flag, (6) weight of straw, (7) weight of root, (8) number of fingers in the main earhead, (9) length of fingers in the main earhead, and (10) the number of thumbs in the early strain.

In the most favourable seasons, the high yield is not brought about by a profusion of earheads, nor is it the rule that in adverse times there is free tillering.

The alteration in the duration of a crop caused by the seasonal changes is found in no way to affect the grain yield.

10. *Korra*. (*Setaria italica*, Beauv.)—*Economic*.—Over 400 units of this Italian millet were sown. From 44 rainfed types that were put under a preliminary test for yield 11 have been picked as being suitable for comparative trial with strain S.I. 523.

Of the 223 selections from a cross between a big single headed irrigated type and many small headed rainfed type, 53 economic selections were carried forward for yield tests.

11. *Panivaragu* (*Panicum miliaceum*, L.).—A cold weather crop of 156 units was raised. The season was very favourable to this *Pani* (dew) *varagu* and an exceptionally good crop was obtained. The new arrivals from Russia and Manchuria fared badly. Studies in the inheritance of characters in this millet were begun. Two varieties, P.V. 36 (straw coloured grain) and P.V. 31 (smoky coloured grain) are promising in point of yield.

12. *Samai* (*Panicum miliare*, Lam.).—A small crop of *samai* was raised consisting of 21 new arrivals and 11 single plant selections. Varietal studies are in progress.

13. *Minor Millets*.—Small bulk crops of P.S. 1, *Arika* (*Paspalum scrobiculatum*, L.) and P.C. 49, *Kudiraivali* (*Panicum crusgalli* var. *frumentaceum*, L.) were raised to meet demands for seed supply.

14. *Lablab* (*Dolichos Lablab*, Roxb. & L.).—Three hundred and sixty-five units of this pulse were sown. This included a comparative trial for yield between three white seeded strains D.L. 173, D.L. 175 and D.L. 201.

The three varieties were equal in yield. Of Buff seeded varieties 16 strains were put to a preliminary yield test and the four best of these, viz., D.L. 89, D.L. 152, D.L. 188 and D.L. 231 have been selected for comparative yield trials next year.

15. *Cowpea* (*Vigna satjang*, Walp.).—Six hundred and eighty-four units of this crop were raised. They consisted of selections from varieties collected from all over the presidency last year, and fresh seed from Kew, Australia and South Africa. Varietal and inheritance studies are in progress in this pulse.

16. *Cluster Beans* (*Cyamopsis psoraloides*, D.C.).—Ninety-two units of this bean were sown. Plant habit was found to be independent of pod length and leaf crinkling. Pods are long, medium or short in length. They are either curved or slightly curved. The relation between the two characters, pod length and pod curvature, is under study. Monogenic segregations have been obtained for the following character pairs, the former in each being dominant: narrow and broad pods, green and light green pods, thin and thick stems, and earliness and lateness.

17. *Soy Beans* (*Glycine hispida*, Maxim.).—Forty samples of this bean were received from South Africa. None of these grew better than the six varieties that have done fairly at Coimbatore. Three of the South African varieties in which some seed could be gathered, were sent to Aduturai. Seventeen other varieties that were sent already are doing well there. The Superintendent reports that all the soy bean varieties are growing well and that there is a bright future for this bean in the Tanjore delta with profit to the land and to the *mirasdar*.

18. *Seed Arrivals*.—About 800 samples of millets and pulses have been received from within and outside India. Among the important arrivals are sorghums from Russia and China, *Tennai* from China, *Cumbu* and *Ragi* from South Africa, and Cowpea from Kew.

19. *Seed Distribution*.—Two strains of *Peria manjal cholam*, A.S. 29 and A.S. 1098, two irrigated white *cholams*, A.S. 367 and A.S. 1575, and one irrigated yellow *cholam*, A.S. 809, are becoming popular. A total quantity of about 14,500 lb. of *cholam* seeds have been distributed.

In *ragi*, E.C. 593, continues to be popular. About 5,500 lb. of seed of this strain have been distributed.

Punjab *cumbu* and Kottappuli *cumbu* M.S. (P.T.) 2229 are finding favour in Coimbatore and Salem. Over 1,000 lb. of seed of these varieties have been made available.

Small samples of millets and pulses have been supplied to other provinces and States in India and to foreign countries like Ceylon, China, Africa, Germany and America.

20. *Famine Seed Reserve*.—In view of the bad season and anticipatory of an unexpected demand, 20,000 lb. of seed of *ragi*, E.C. 593, has been secured from the Central Farm and stored.

This strain has done well in the Hindupur and Kadiri taluks of the Ceded districts; it yields about 20 per cent more than the local seed and is ten days earlier.

21. *Instruction to Students*.—Students of B.Sc. III class visited the station with their Botany lecturers in January 1936. The millets in the field were freely used to illustrate their botany and Mendelism. This was followed up by a special lecture on "Mendelism in Millets." In addition to this, students visited the station in small batches to acquaint themselves with the field operations in progress.

Students from the Indian Institute of Science and the Central College, Bangalore, and the students of the Agricultural School, Trichur, were taken round the station and given an insight into its work.

22. *Madras University Extension Lecture*.—Under the auspices of this University Extension Board, I delivered a popular lecture on the "Study of Crops" at the Government College, Coimbatore.

23. *His Majesty's Silver Jubilee*.—The Millets Breeding Station celebrated the occasion with due jubilation.

24. *Exhibitions*.—A set of millet exhibits was sent to the Assistant Director of Agriculture, Tinnevely, and to the Headmaster, Agricultural Middle School, Usilampatti, for their respective show rooms.

Exhibits were also sent to the All-India Swadeshi Industrial Exhibition and the Jubilee Fancy Fair Exhibition at Salem, to the Park Fair Exhibition at Madras, the *Vaikunta Ekadasi* Exhibition at Srirangam and *Tai Pusam* Exhibition at Palni.

During the College Day and Conference in August 1935, a full exhibition illustrating the section's work was put up.

25. *Reports*.—The following reports were written up during the year. (1) The fifth and sixth half-yearly reports on the Three Year Programme of work. (2) A Popular Account of the work of the Millets section since the inception of the reforms. (3) An account of the latest work of the section for publication in the *Chronica Botanica*. (4) A joint note with the Mycologist on striga, the parasitical plant on cholam, for the Imperial Council of Agricultural Research. (5) Yield figures for improved millets as conditioned by weather factors. (6) Cost of production of millets in bulk. (7) A summary of the Progress of Scientific and Other Important Agricultural Work on Millets.

26. *Press Notes*.—A note on the performance of *ragi* strain, E.C. 593, was written up and it appeared in the press in December 1935.

27. *Publications*.—Considerable advance in the knowledge concerning millets, the food crops of the poor, was gained during the year. Fourteen articles on *Cholam*, five on *Cumbu*, two on *Korra*,

one on *Ragi* and five on *Lablab* and other pulses were published in the Madras Agricultural Journal, the Indian Journal of Agricultural Science, New Delhi and other Indian journals.

28. *Meetings*.—I attended meetings in connection with the following:—(1) As a member of the organizing committee of the Symposium on Disease Resistance in Crops held during October at Coimbatore. (2) As a member of the Joint Committee of the Dry Farming Scheme, Hagari. (3) As a member of the Committee for the scrutiny of Agricultural station reports. (4) The discussion with the Statistician of the Imperial Council of Agricultural Research on statistical problems connected with plant growth.

29. *Indian Science Congress*.—I attended the 23rd annual meeting of this Congress held at Indore in January 1936 and read a paper on "The Occurrence and Inheritance of Dimpling in Sorghum Grains."

30. *Visitors*.—Prominent among the many visitors to the section may be mentioned His Highness the Maharaja of Cochin, Sir R. K. Shanmugam Chetty, the Hon'ble the Minister for Development, the Imperial Mycologist, Pusa, Principal Gokhale of Poona, Prof. T. Tanaka of Japan, and Messrs. C. Ramalinga Reddy, Pandit Kunzru and Mahboob Alam.

A batch of students from the Indian Institute of Science and the Central College, Bangalore, also paid a visit.

31. *Acknowledgments*.—I record with grateful pleasure the sincere work and hearty co-operation of my staff.

G. N. RANGASWAMI,
Millets Specialist.

(15)

ADMINISTRATION REPORT OF THE OIL SEEDS

SPECIALIST FOR THE YEAR 1935-36.

I am submitting my administration report for the year 1935-36.

2. I remained in charge of the section throughout the year.

3. The work of my section may be divided into two main divisions: (a) advisory and (b) research. The advisory service consists of advising the public, members of the Agricultural and other Government departments on matters connected with oil-seeds. Several enquiries were received from the Jail, Industries and Labour departments. I served on the Technology Committee of the Annamalai University and drew up a course of training in oil technology. The research work consists in carrying out original investigations on the groundnut, the castor, the coconut and the gingelly all of which are directed to effect improvement in agricultural practices leading either to an increase in yield, the improvement in quality or to a decrease in the cost of production. The report deals very briefly with some of the more important items of work.

4. A feature of this year's activities has been the comprehensive work on the analysis of the samples of groundnut collected from all over India by the various Marketing Officers. This scheme is financed by the Imperial Council of Agricultural Research. The samples are being analysed both for oil content and free fatty acid and refraction. Two hundred and fifty samples were analysed chemically and 460 for refraction. This should enable the standardization of the grades of groundnut.

5. The opening of a new station, 49.28 acres in extent on the 1st June 1935, at Tindivanam as sanctioned in G.O. Ms. No. 477, Development, dated 25th March 1935, was the event of special importance not only for my section but also for the public of the Presidency. This measure will enable me to conduct comprehensive investigations on the oil-seeds and the groundnut in particular.

GROUNDNUT.

6. *General*.—The season was late by about a month. The prolonged period of drought during the north-east monsoon period adversely affected the yield of the spreading varieties. That the improved variety *Saloum* continues to enjoy the confidence of the public is evinced by the fact that the demand much exceeded the supply of its seed. The demand for seed from other provinces is keen. The Second Economic Botanist reports that our selection No. 18 has done very well in Bengal.

7. *Varietal trials*.—The varieties *Native Tanganyika* and *Saloum* were compared with the *Local Mauritius* variety. The increased yield of the former over the local was 23 per cent, and of the latter 17 per cent. Among the bunch varieties *Tennessee white* and the *Improved Spanish 2-B* were found superior to the *Gudiyattam bunch*. The yields of the important varieties per acre were:

Gudiyattam bunch, 1,007 lb. per acre.
Improved Spanish 2-B (bunch), 1,325 lb. per acre.
Tennessee white (bunch), 1,319 lb. per acre.
Local Mauritius (spreading), 1,036 lb. per acre.
Saloum (spreading), 1,210 lb. per acre.
Native Tanganyika (spreading), 1,276 lb. of pods.

Twenty-four selections from spreading varieties which yielded well during the past four seasons were further tested with the *Saloum variety*. Of these only selection No. 193 yielded significantly more than the check, the increase being 12 per cent.

In addition to these, 214 selections from the spreading varieties, and 50 selections from the bunch varieties were tested in the preliminary trials.

8. *Hybridization*.—To induce variations and to make selections therefrom interspecific crosses were made successfully between *Arachis hypogea* and *A. rasteiro*, and *A. rasteiro* and *A. nambyquara*.

Over 1,400 F_2 families, and 179 F_2 families were studied during the season. Numerous selections were made in F_3 s. From the study of these progenies the following conclusions may be drawn:—

- (i) Purple crescent on the standard petal of corolla is dominant over the absence of the crescent, and segregation occurs in the ratio of 3 : 1 in the second generation. The crescent is exhibited only in the presence of one of the factors for purple pigment in the plant.
- (ii) In the ordinary groundnut of commerce the testa or the seed coat is complete, but in the species *Arachis nambyquara*, it appears split on account of its failure to keep pace with rapidly developing embryo. The testa in *A. nambyquara* being red in colour and the tegmen of the seed coat white, it appears ruptured. This character of ruptured testa is incompletely dominant over complete testa 1 : 2 : 1 ratio is obtained in the second generation.
- (iii) The plants with completely prostrate branches—trailing habit—are dominant to spreading habit, but the trailing habit is expressed only when it is accompanied by homozygous dominant factors for spreading habit.
- (iv) The bunch varieties have comparatively larger leaves and the spreading varieties have smaller leaves. The first generation progeny of such differing types have medium

sized leaves and in the second generation one plant having large, two having medium and one having small sized leaves are obtained.

The pods of some of the groundnut varieties have distinct beak, while in others the beak is indistinct. Distinct beak was found dominant over indistinct beak and in the second generation 3 : 1 ratio was obtained.

9. *Correlation studies.*—A positive and significant relationship between the ratio of the average length of the primary branches to the height of the main axis, and the weight of the pods was established in both the bunch and the spreading types. In a crop like the groundnut where the produce is underground it is difficult to select the plants before they are harvested. The fact that the plants having proportionately shorter main axis when compared with their primary branches yield well, should help considerably in selection.

CASTOR.

10. *General.*—Owing to the absence of summer showers and delayed south-west monsoon, the season was late by nearly two months. The crop is still being harvested and the figures as far as available show that the selection Nos. 211, 214, 215, 217/2, 262, 263 and 264 are superior to the local variety. The interim yield varies between 400 to 600 lb. of beans per acre.

11. *Breeding.*—Eighty-five economic selections and 160 types were grown for further inbreeding and multiplication. The results of continued inbreeding do not show any deterioration, and this suggests that the castor oil plant is not as extensively cross-pollinated as is generally presumed to be. To estimate the percentage of natural crossing pure breeding recessive types were grown among the pure breeding dominant types, and their progenies were studied for the occurrence of natural crossing. It was found that 5 to 14 per cent. of the plants in the progeny were naturally cross-pollinated.

A number of decorative types which present attractive appearance, have been evolved by hybridization. Fifty economic types were selected from among the progenies of the crosses. About 2,000 plants which formed the progenies of the crosses were studied for the inheritance of characters.

GINGELLY.

12. *General.*—The inheritance of seed coat colours, habit and corolla colours was worked out in the gingelly.

Of the sixty-three varieties collected from all over India, and tried on the Central Farm, twenty-two varieties did not develop phyllody and in thirty-one varieties, the incidence of phyllody varied from 50 to 98 per cent. Most of the South Indian varieties were subject to the attack of phyllody.

COCONUT.

13. *General.*—Rainfall was deficient during November to May, and the season, on the whole, was unfavourable. It has been found that the rainfall during this period affects the yields for three succeeding years. The harvests of nuts from the coconut stations were 77,553 and 82,587 for 1935 and 1934, respectively.

14. *Breeding.*—The last lot of nuts obtained by hybridization, selfing and natural pollination was sown in the nursery. The seedlings from similar nuts obtained in 1934 were planted during September at Nileshwar II and these are coming up well. Promising among these are the seedlings from the dwarf male parent. Accurate records of the growth of these seedlings are being maintained.

15. *Floral biology.*—Some of the trees produce year after year a large number of barren nuts. The female flowers of fifteen such trees were artificially pollinated with pollen of known viability. It was, however, found that artificial pollination did not minimize the production of barren nuts. To increase the yield, artificial pollination of the female flowers has been recommended in the West African Oil Palm by some of the workers. This has been practised in the date palm for centuries. But from a number of experiments it is found that artificial pollination does not increase the yield of the coconut.

The north-east monsoon period is probably the best period for the development of the female flowers. The shedding is very much delayed and the flowers exhibit a tendency to stay on longer. The shedding of buttons of a particular age is influenced by the prevailing weather conditions.

16. *Seed nuts.*—An interesting feature of the year's work is the testing of seed nuts from the different centres of production on the West Coast. The rates of germination for the seed nuts and the rates of growth for the seedlings obtained from these nuts were determined; it was found that the seed nuts from Sivapuram were superior to others.

The best "posture" that should be adopted for the seed nuts when they are placed in the nursery is a much debated subject among the cultivators. The nuts were placed vertically, obliquely and horizontally in the nursery and they were allowed to germinate. The nuts that were placed vertically showed the best results for early and total germination.

17. *Seedlings.*—Deep planted seedlings are found to produce a large number of roots in the lower zone of the soil. The practice of deep planting is to be preferred to that of surface planting. The surface planted seedlings are more likely to suffer during the dry period.

18. *Manurial experiments.*—The yield of the plots receiving ammonium sulphate and ashes was 23 per cent higher than the yield of the control plot. Whether the application of manures in

trenches is to be preferred to application by broadcasting is a question which is still undecided since the data are not conclusive.

19. *Cultural experiments*.—A plot cultivated up to 1932 and thereafter left uncultivated has deteriorated remarkably. Its yield and production of female flowers and leaves are low. This shows that cultivation should not be neglected even for a short period of three to four years. Another plot which was left uncultivated for fifteen years and taken up for cultivation from 1932, has improved so much in yield that it is even better than the plot mentioned first. The advantages of inter-cultivation are so patent that it must continue to form one of the chief features of the propaganda for the improvement of the coconut.

20. *Copra and yield of nuts*.—There is a popular impression that the trees yielding a large number of nuts produce comparatively small nuts. From a study of the copra content of the nuts from forty-eight trees it was found that the high yielders, on the whole, produce more copra per nut than the poor yielders and that the high yielders do not produce such small nuts as is generally presumed.

21. *Shoot rot manurial experiment*.—Whereas the percentage of infection was as low as 2 in the plots manured with potassium sulphate, the infection in the no-manure plot was 48 per cent. This together with the analagous results obtained during the previous two seasons definitely establishes a suitable measure for the control of shoot rot.

MISCELLANEOUS.

22. *Safflower*.—Thirty-four Pusa types were sown in small beds at Coimbatore. Types 1 and 28 are apparently superior to the rest. They yielded 618 lb. per acre and the duration was 82 days.

23. *Sunflower*.—Two varieties of sunflower were sown on the Central Farm and the yields per acre were: *Salisbury large white*—1,800 lb; *Salem Dharmapuri*—900 lb. The former was found to contain 31.76 per cent oil in achenes and the latter 28.73.

24. *Cytology*.—The chromosome numbers of the following plants were determined:—

Safflower—Pusa type 24: $n=12$; $2n=24$.

Phœnix farinifera: $n=18$.

Mr. U. Narasinga Rao, research student determined the chromosome numbers in the Indian cork tree, *Millingtonia hortensis*: $2n=30$; and $n=15$.

The cytology of the lemon grass species was worked out by Mr. C. N. Babu, research student:—

Cymbopogon nardus: $2n=20$;

C. citratus: $2n=60$;

C. polyneurus: $2n=20$ and $n=10$;

C. cæsius: $2n=22$ and $n=11$;

C. martini: $2n=40$ and $n=20$;

C. flexuosus: $2n=20$; and

C. flexuosus (another variety) $2n=39$ and $n=19+1$.

25. *Seed distribution*.—The following quantities were distributed:—

	LB.
Groundnut	3,411
Gingelly	62
Cashewnuts	93
Coconut seed nuts	7,343
Coconut seedlings	90
Tapioca sets	150

26. *Publications*.—The following papers were published during the year. In addition to these, five notes were also published:—

(1) Oil formation in groundnut.

(2) Certain factors affecting the marketing of coconuts.

(3) Inheritance studies in gingelly.

(4) Increasing the yield of groundnut.

(5) Inheritance of characters in the groundnut.

(6) Rainfall and yield in the coconut.

COIMBATORE,
28th April 1936.

J. S. PATEL,
Oil-seeds Specialist.

ADMINISTRATION REPORT OF THE GOVERNMENT ENTOMOLOGIST, COIMBATORE, FOR 1935-36.

I beg to submit the following report on the activities of the Entomology Section for the year ending 31st March 1936.

II. CHARGE.

Rao Sahib Dr. T. V. Ramakrishna Ayyar was in charge of the Section from 1st April 1935 to 7th June 1935, and from 8th July to 19th July 1935. I was in full additional charge of the Section from 8th June to 7th July 1935, during his leave on average pay and took over charge of the post of Government Entomologist with effect from 20th July 1935, on which date Dr. Ramakrishna Ayyar retired from service. I continued to be in charge of the Section for the rest of the year under report.

III. SPECIAL INVESTIGATIONS DURING THE YEAR.

Besides the attention paid to the various pest enquiries and reports received during the year from various parts of the Presidency, intensive studies were made of some of the major crop pests and considerable data gathered. Some of these have been continuations of the studies of the previous year. The more important of these items of research are the following:—

(1) *The Paddy stem borer (Scharnobius incertellus)*.—An intensive study of the pest under several aspects was carried on at Coimbatore throughout the year in co-operation with the Paddy Specialist and the Central Farm authorities, paying special attention to (a) incidence—varietal and seasonal, (b) the behaviour of the pest's life cycle in relation to the age and variety of the crop at different periods in the year, (c) the effect of a light trap on the degree of damage to the crop as well as its effective range, (d) the nature of the broods and their time of appearance in relation to the age of the crop, and (e) the effectiveness of the various means of control and the like. With the above point in view, counts of white ears were taken for several types and varieties, early and late in the season, at the Central Farm Paddy Breeding Station and in the adjoining villages round about Coimbatore. In this connexion, data were collected also from Palghat, Pattambi and the Tanjore delta as opportunities occurred. The late maturing as well as the second crop showed invariably a heavier percentage of attack and there was no variety completely resistant. The Central Farm light trap trials clearly showed a marked difference in the extent of damage between the experimental area and the average condition outside, besides revealing the fact that the range of efficiency of a 200-candle power light is only a radius of about

350 yards as estimated by counts of 'white ears'. It was found necessary to have continuous trapping for about 40 days only for two broods, under single crop conditions, at the Central Farm. As estimated by the counts of dead hearts, tillers, eggmasses, moths, etc., in trial and control plots in ryots' field it was found that 'seedling selection' at planting, was not by itself a method of control to minimise injury to the crop, at a time of moth abundance. Apart from the above observations, efforts were made to study the life history of the insect at the Insectary in potted plants and in the field in field cages. Search was made for alternate food plants and stubbles were examined to follow the pest during off-season. Plenty of eggmasses from the field were also collected to study the parasites. With regard to the bionomics of the insect, it appears that the insect's best season of activity is during periods of moist warm weather with plenty of standing water for the crop. Under such favourable circumstances, the insect multiplies successfully, the larvae are most active and the moths are of normal size and bright colour.

(2) *The Paddy army worm (Spodoptera mauritia)*.—The life history study of this insect was continued for six broods at the end of which the moths failed to lay eggs in March 1936 with the change in weather condition. The structure of the pupæ in the sexes, the habits in pupation, the duration of the life cycle in successive broods, were specifically noted. The behaviour of the insect under field conditions was noted in several places such as Coimbatore, Palghat, Pattambi and Mullasserri, at different parts of the year, all in young paddy, sown in puddle. The special study of the moth's activity and incidence, in the Kole paddy, was continued and interesting notes made. Very important observations were added on the following points, mainly (a) the manner of actual egg-laying at night in field and elsewhere, (b) the occurrence of two predatory beetles and a possible parasite which lays eggs in the eggs of the host, (c) the possibility of the moths being induced to lay eggs on suitable host plants for destruction of eggmasses in a collected form, and (d) the effectiveness of certain baits and light traps for destruction of moths and the like. The year's observations are again suggestive of the strong and profound influence of the microclimatic conditions in attracting large influx of moth population in the area all on a sudden within 3-4 days of sowing and germination of the crop.

(3) *Pests of tomato*.—The pests of tomato studied during the year were *Laphygma*, *Prodenia*, *Chrotogonus* and *Ophideres* spp. Of these, *Laphygma* appeared in the nurseries and was kept in check by dusting Calcium arsenate. The trouble from *Chrotogonus* which was a pest of fresh transplants was got over by planting more seedlings than the required number. *Prodenia* was only a leaf feeder in the beginning but later on attacked the fruits also by boring into them. This was checked by systematic handpicking of caterpillars. By far the most serious pest of tomato was the fruit-sucking moth; it was, in fact, a menace to tomato cultivation both in the previous year and during the year under review.

The moths were noted in very large numbers at night sucking the fruits as a result of which rotting set in and the fruits were found unfit for human consumption. As many as five moths were found on a single fruit on certain occasions. Both *Ophideres materna* and *O. fullonica* were noticed, the former predominating. Of all the control methods tried, the most effective was bringing suddenly a bright light near the moths at the time of feeding which stupefied them. As the moths were then unable to fly they were handpicked easily and destroyed; thus hundreds of moths were exterminated.

(4) *Fruit flies*.—Trypetids or fruit flies are known to infest different kinds of fruits and as many as twenty species have been collected in South India. During the year, the bionomics and life history of the Coccinia fly—*Dacus brevistylus*—were studied in detail. Another fly—*Dacus ferrugineus incisus*—noted breeding in mango, guava, tomato, orange, plum, etc., was found inside berries of one of the wild *Solanum* common in the Nilgiris—*Solanum verbascifolium*. To study the seasonal incidence of the flies, the *Solanum* berries are being collected every month for examination. Besides these studies, fly control methods such as poison baits were under trial. Parasites of the flies also received some attention.

(5) *Cotton bollworms* (*Platyedra* and *Earias*).—The relative percentage of infestation of the bollworms in Cambodia, Uppam and Karunganni was studied, week by week, in one of the fields in the Central Farm. Cambodia cotton at the foot of the Anamalais was also examined for the bollworms. Experiments were devised to study the attraction, if any, of the pink bollworm (*Platyedra*) to certain chemical substances. Oils of Geraniol, Citronella, Cinnamom, Clove and Amygdale; Amyl acetate, oil of Lemon grass, Terpinol, Eugenol and oil Anisi were exposed in glass vials in cotton fields but none of these attracted any moths. Blue and green coloured lights also had no attraction for them. Attempts to rear *Microbracon lefroyi*—a parasite of the pink bollworm did not succeed though the larvæ were stung and paralysed. It is proposed to do breeding work using gelatine capsules as receptacles for the host caterpillars.

(6) *The cotton stem weevil* (*Pemphres affinis*).—Counts taken in January in one of the central farm fields showed that Cambodia, Uppam and Karunganni had 52 per cent, 9.8 per cent and 0.6 per cent of infestation respectively. Different taluks in Salem and Madura districts, from which petitions to exempt the area from the operations of the Pest Act were received, were inspected for noting the infestation due to the stem weevil and the bollworms. Some information has been obtained during the year regarding the distribution of *Pemphres* in India and also in foreign countries.

(7) *Moth borers of sugarcane*.—In South India, the most important pests of sugarcane are the moth borers, and we have two species of *Diatraea* (*D. sticticrasis* and *D. venosata*) and two species of *Scirpophaga* (*S. monostigma* and *S. auriflua*) with us. The study of these borers was continued during the year. Information on the early symptoms of damage done by caterpillar is being gathered with a view to applying control methods in time. In the case of *Scirpophaga*, the moths found in the field are regularly collected for noting the proportion of the two species and the season for their emergence. Special attention is being devoted to the parasites of the different borers to see whether these could be reared in large numbers and liberated in affected fields. A cane pest calendar for the Madras Presidency was prepared during the year.

(8) *The Diamond back moth* (*Plutella maculipennis*).—Cabbages grown on the insectary field showed a severe infestation of the diamond back moth, and hence a study of this pest was taken up. On the control methods tried Derris root powder was found very effective. During the course of the investigations a fairly effective Chalcid parasite of the caterpillars was noticed and its habits were studied.

(9) *Pests of Moringa pterygosperma*.—A study was made of the caterpillars infesting the leaves and buds of this plant. Examination of the flower heads during the different months showed that, in certain months, about 80 per cent of the buds were affected. The pests and the parasites were studied in detail. Trials of repellents, such as, crude oil emulsion, bordeaux mixture, sulphur, etc., are being made.

(10) *The fluted scale* (*Icerya purchasi*).—The present position of the notorious fluted scale—*Icerya purchasi* in the Nilgiris, against which the Entomological Section has liberated its predator—*Vedalia cardinalis*—has been examined during the year. Slight infestation was noticed on wattles, rose, gorse and *oxalis* sp., in a few places, but wherever the scales were present the predators were also in evidence. For the first time *Icerya* was noticed on a few tea bushes in Kotagiri, but prompt measures were taken to destroy them.

(11) *Mite pests of crops*.—Among non-insect pests, mites (*Acarina*) are coming into prominence. During the year, reports of mite attack were received from Guntur, Penukonda, Tindivanam, Coonoor and Coimbatore on different crops, such as cholam, castor, rose, fig, cotton and jasmine. Dusting with flowers of sulphur has given satisfactory results. The results of the studies of mites have been written up, and a paper on "The mite pests of crops in South India" was sent to the Indian Science Congress.

(12) *Natural enemies of crop pests*.—During the year, studies of the Hymenopterous and Tachinid parasites of different crop pests received some attention. Detailed notes were prepared of these insects for publication.

(13) *Trials of insecticides*.—Hillo, Vermol, Derris root, Nicotino-sulphate, Activated fish oil, rosin soap and four different kinds of vegetable insecticidal soaps were under trial during the year. The trials will be repeated and reports sent to the various firms concerned, in due course.

(14) *Pests of stored products*.—The relative incidence of the grain beetle—*Rhizopertha dominica*—on different varieties of paddy received from the Paddy Specialist was studied during the year. Similar experiments have been started with the weevil—*Calandra oryzae*—on various varieties of cholam got from the Millets Specialist. Studies on the bionomics of the pulse bruchid—*Bruchus analis*—were made at the Insectary.

(15) *House flies*.—Experiments in the control of flies by means of fly maggot traps were continued. Trials were made to see whether the addition of certain chemicals to the dung in the trap had any added attraction for flies to oviposit. Various substances such as Citronella oil, Amyl acetate, Eucalyptus oil and Amyl butyrate were sprayed on the dung at the rate of $\frac{1}{4}$ ounce in a gallon of water, and of these, the Citronella oil gave the best results as evidenced from the larger number of maggots caught in the trap.

(16) *The Cholam leaf disease*.—Work on this was continued from October and carried on till the following January, when the experimental plots were harvested. Counts of affected plants showed a total infestation of 12 per cent of which the 'yellow' had 4.8 per cent and the 'stripe' 7.2 per cent. The cholam shoot bug from affected plants, when transferred on to healthy seedlings raised under muslin topped chimneys, were able to transmit the disease, and the plants developed the characteristic symptoms within a week of transference. The plants inoculated by the pin prick and smearing methods did not take infection and remained healthy in either case. Some of the grasses on the bunds, such as *Brachiana ramosa*, *B. distachya* and *Dichanthum annulatum* showed symptoms similar to those found on affected cholam plants. Since the intensity of the disease was more pronounced towards the bunds, it is suspected that the grasses may be carriers of the disease. Experiments will be carried out to see whether the grasses have anything to do with the cholam disease. Color plates and photographs of the affected cholam and grass plants were prepared.

IV. LIFE HISTORY STUDIES AND PEST CONTROL WORK AT HEADQUARTERS.

At the Insectary, which was in charge of Assistant Entomologist, Mr. T. V. Subramaniam, the usual breeding of insects collected locally and received from outside was carried on by all the members of the staff. Some time was also spent in attending to pest control work in the Central Farm and breeding stations.

V. PLANT QUARANTINE AND FUMIGATION WORK.

About 102 lots of various seeds received from officers of the department and private parties were examined for insect pests, fumigated, when necessary, and pest free certificates issued. At the request of the Millets Specialist, his field laboratory infested with store insects was fumigated with Calcium cyanide. In addition to this, some appreciable time was devoted by the section in examining and passing seed canes for the Government Sugarcane Expert.

VI. BEE-KEEPING.

Numerous enquiries on bee-keeping from different parts of India were received and attended to during the year under report. Our Apiary was the centre of attraction to numerous visitors interested in this cottage industry. There was a great demand for the colonies, hives, extractors, etc., which was met as far as possible. There is therefore every reason to believe that bee-keeping, as a cottage industry, is gaining rapid popularity.

An average strength of about 40 bee colonies was maintained throughout the year. The condition of the colonies was quite satisfactory during April and May, but from June to September there was a decline in their strength owing to adverse weather and pasturage conditions. Consequently, there was also trouble from the natural enemies. There was, however, considerable improvement in the progress of the hives after the receipt of light showers in September and October. During the year, three out apiaries were opened at different centres of the estate to solve the problem of finding adequate pasturage for bees and this had its desired effect.

Besides the routine maintenance of the hives, research work on various aspects of bee-keeping was continued and considerable progress was made in the study of items, such as bee pasturage, range of flight of workers, control of natural enemies, such as the wax moth and the black ant, swarm control, egg-laying capacity of the queen, effect of shifting bee colonies, etc.

A good deal of propaganda work was also done by the section. The short course on bee-keeping, which was instituted last year, was conducted this year also in February. Twenty-five students from various parts of the Presidency joined the course. Most of the students took a very keen interest in the subject, and it is earnestly expected that they will begin bee-keeping in their respective localities. Demonstrations in handling and hiving of the colonies were given at various centres, such as Kumbakonam, Nidamangalam, Kotagiri, Salem, Ponnani and Palghat, and these were well attended. As a result of our demonstrations, a few private apiaries are now maintained in all these places. Nine hives with bees, fifty-one empty hives, two bee colonies only, seven smokers, six honey extractors and one queen excluder were distributed during the year.

VII. ERI CULTURE AND LAC CULTURE.

Eight broods of eri worms were reared during the year, mainly for the purpose of supplying eggs to rearers in different parts of the Presidency. A few mulberry silkworms were also reared for demonstration purposes.

Lac colonies liberated on different trees on the Estate to see whether they could thrive under Coimbatore conditions, were kept under observation. Their progress during the year was not quite satisfactory, due mainly to the activities of the predator moth—*Eublemma*.

VIII. ENTOMOLOGICAL WORK IN THE DISTRICTS.

The Entomological Assistants deputed to the different circles under circle officers had a very busy time attending to pest enquiries and collecting information on the various pests of crops in their respective localities. They organized campaigns, conducted demonstrations and took part in various exhibitions.

IX. COLLECTIONS AND SYSTEMATIC WORK.

Due to the retrenchment of the post of the Systematic Assistant Entomologist and the increase in items of economic work, it was not possible for the members of the section to do much in the way of systematic work. However, some work was done in Hymenopterous parasites, Trypetids, Aphids and Acarina.

Consignments of various insect orders were submitted to the Imperial Institute of Entomology, London, Bureau of Entomology, Washington, Professor Drake of Iowa, Dr. Takahashi of Japan, Mr. Bromley of Massachusetts, and also to other specialists for identification, and our thanks are due to them for the help rendered in this connexion.

In addition to this, small lots of insects were identified by us for various parties, among which include thrips on sugarcane for the Imperial Entomologist, Pusa, Aphids on sugarcane for the Government Sugarcane Expert, Coimbatore, sandal insects for the Research Ranger, Denkanikota, Salem, and Michelia insects for the Forest Research Institute, Dehra Dun. Specimens of insects were also sent on loan to various specialists for their study.

X. SCIENTIFIC PAPERS PREPARED AND PUBLISHED.

The following papers were prepared during the year:—

- (1) "The Soorai disease of paddy" by M. C. Cherian, P. N. Krishnaswamy, S. Ramachandran and C. V. Sundaram, published in the Madras Agricultural Journal.
- (2) "A note on the Jassid pests of paddy" by M. C. Cherian, published in "Current Science."
- (3) "Mite (Acarina) pests of crops in South India" by M. C. Cherian.
- (4) "Bionomics of the swarming caterpillar of paddy in South India" by K. P. Anantanarayanan and Dr. T. V. Ramakrishna Ayyar.

- (5) "Some problems connected with the stem borer pest of rice in South India" by Dr. T. V. Ramakrishna Ayyar and K. P. Anantanarayanan.
- (6) "Kole cultivation of rice in the Malabar Coast with special reference to insect pests" by Dr. T. V. Ramakrishna Ayyar and K. P. Anantanarayanan.
- (7) "Some control experiments on the Deccan grasshopper" by M. S. Kylasam.
- (8) "Agricultural Meteorology in its relation to insect pests" by Dr. T. V. Ramakrishna Ayyar and K. P. Anantanarayanan, published in the "Madras Agricultural Journal."
- (9) "The leaf curl disease of chillies by thrips in Guntur and Madura" by Dr. T. V. Ramakrishna Ayyar, M. S. Subbiah and P. S. Krishnamurthy, published in the "Madras Agricultural Journal."
- (10) "Some hints to amateur bee-keepers in South India" published in the "Villagers' Calendar, 1936."

XI. MISCELLANEOUS.

Artists' work.—(1) The following items of work were attended to in the Artists' section under my supervision—Pen and ink drawings 224; Charts 213; Sketches 48; Photographs 710; Prints 2,400; Enlargements 266; Lantern slides 658 and Labels 1,347.

(2) *Exhibitions and Shows.*—Show cases of insects and coloured plates, posters and bromide enlargements of various crop pests and beneficial and useful insects were sent to various shows and exhibitions during the year.

(3) *Research Council.*—I attended the half-yearly meetings of the council in August 1935 and March 1936 when the half-yearly programmes of the section were discussed.

(4) *Special Lecture.*—As desired by the Principal, I delivered a lantern lecture on "Acarina and their economic importance" to the students of the I and II year B.Sc. (Ag.) classes.

(5) *Sugarcane pests research.*—As kindly permitted by Government, I attended the meetings of the Committee of Entomologists convened by the Imperial Council of Agricultural Research at New Delhi in February 1936 to discuss the sugarcane pests' scheme.

(6) *Supply of live parasites to foreign Entomologists.*—Mr. W. B. Gurney, Entomologist, New South Wales, visited Coimbatore in connexion with the study of fruit fly parasites. As permitted by you, he was given every facility for working in the Insectary, and for collection of parasites in Coimbatore and the Nilgiris. He left for New South Wales at the end of December with a consignment of parasites bred at our Insectary. At the request of Dr. Hutson, Entomologist, Ceylon, live Eulophiad parasites of the coconut caterpillar were sent for breeding and liberation in affected coconut topes.

M. C. CHERIAN,
Government Entomologist.

7th May 1936.

ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST FOR THE YEAR 1935-36.

Paddy (Oryza sativa)—Foot-rot disease.—Investigation on this disease was continued on the lines indicated in previous reports and further trials were made with different fungicides and it was found that seed treatment with Bordeaux mixture was not effective in controlling the disease and, Ceresan in spite of its highly poisonous nature, was still by far the best fungicide that can be recommended for the control of this disease.

2. *Sugarcane—Mosaic—Varietal resistance trials.*—Twenty-eight varieties of sugarcane were tested for their relative susceptibility to mosaic disease under field conditions.

Varieties Co. 313, Co. 331, Co. 354, Co. 360, Co. 361, Co. 417, Co. 419, Co. 426, Co. 429 and Co. 515 showed infection ranging from 40 to 60 per cent.

Varieties Co. 229, Co. 326, Co. 335, Co. 355, Co. 356, Co. 413, Co. 508 and P.O.J. 2878 remained uninfected during the year.

Co. 353, Co. 411 and Co. 412 showed a high degree of resistance.

Some of the varieties which proved resistant in the field were again subjected to artificial infection by the pin-prick method and of these Co. 205 which remained uninfected in the field took infection and showed signs of mosaic indicating that the variety was liable to take infection under certain special conditions, while under field conditions it remains free.

Histological studies.—To find out the difference between the structures of healthy and mosaic affected leaves, microtome sections of the leaf tissue were prepared and examined. No essential difference could be noticed between the healthy and diseased leaves except in the reduction of the size of cells in the latter.

Seed transmission.—Plants raised from seed collected from mosaic affected clumps of the variety Co. 213 did not show the disease. It can now definitely be stated that sugarcane mosaic is not transmitted through the cane seed.

Masking.—Consequent on the observation that the mottling symptoms disappeared after some time in a few varieties, a series of experiments was done to find out if the disappearance of the symptoms was due to the recovery of the plants from disease or only cases of 'masking' of symptoms. The experiments indicated that under certain conditions, the plants definitely recovered from the disease, all traces of infective virus in them being

completely lost. Pin-prick inoculation trials also proved that plants which recovered from the disease once are more or less immune to further infection.

3. *Tobacco—Black shank.*—The experiment started last year was repeated at Attur (Salem district) to find out suitable remedial measures against this disease. The treatments consisted of (1) sterilization of seed bed by burning trash, (2) disinfection of seed by treatment with dilute silver nitrate solution and (3) protection of plant in the nursery and in the transplanted field by spraying with 1 per cent Bordeaux mixture. It was found that the treatments were effective in controlling the disease.

Varietal resistance.—Pure cultures of the fungus *Phytophthora parasitica* var. *nicotianæ* were obtained and inoculation trials were made on 14 varieties of tobacco with a view to testing their resistance to infection. (1) Adcock, (2) Pusa type, (3) Cash and (4) Shade proved resistant while others took infection.

4. *Ragi—Helminthosporium.*—The fungus was isolated from diseased ragi plants received from Bellary and inoculation trials proved that the fungus was virulently parasitic on ragi and causes foot-rot, leaf-spot and ear-head blight of ragi. Finding out varieties which are resistant to the disease and treatment of seed are indicated as remedial measures.

5. *Wilt studies in Macrophomina phaseoli.*—The fungus was isolated from wilted horsegram plants collected at the Millet Breeding Station, Coimbatore, and its pathogenicity on horsegram and other hosts was tested by inoculation experiments. The fungus was found to be a virulent parasite on horsegram and also capable of infecting French bean and blackgram plants. It was not able to infect gingelly, Karunganni cotton and cow pea plants. On the other hand, the strains of the fungus isolated from all the abovementioned plants were able to parasitize horsegram. It was also found that the horsegram plants were most susceptible to attack when they are in the seedling stage and that all parts of plant root, collar, cotyledonary node, shoot and leaflets were equally vulnerable to the attack of the fungus. Experimental evidence was obtained that the disease was not seed borne. The cultures of the fungus were studied in the laboratory and attempts were made to induce formation of pycnidia.

Cotton—Wilt—Longevity of the fungus.—The fungus does not remain viable in soil for more than a year.

Macrophomina on Cuminum Cyminum.—The fungus *Macrophomina phaseoli* was isolated from *Cuminum Cyminum* for the first time.

6. *Cholam—Yellowing disease.*—Experiments done during the year furnished evidence that the disease was definitely of virus origin and is transmitted by an insect vector.

7. *Plantain—Panama disease—Field experiments to test varietal resistance.*—An experiment was laid out at Srinivasanallur (Trichinopoly district) to test the relative resistance of seven varieties of plantain. None of the varieties have taken infection so far.

Treatment with Malariol.—Further trials with this oil showed that the oil was effective in killing the diseased plant and rendering it innocuous by preventing the fungus sporulating and causing infection to other healthy plants.

8. *Areca palm—Bud-rot.*—A disease of areca palm hitherto unrecorded in South India has been noticed in Murkanad, Malabar. The symptoms of the disease are :—The leaves break at the joint of the leaf sheath or a little higher the leaflets turning yellow and drying up. Gradually the infection spreads to the bud which is ultimately killed. The disease spreads rapidly in the rainy season. The fungus *Thielaviopsis* has been found associated with the disease.

9. *Cereal Rusts.*—Attempts were made to induce germination of uredo and teleuto spores of wheat rusts collected from the Nilgiris in the laboratory at various temperatures 3° to 30°C, but without success.

10. *Diseases of orchard and vegetable crops—Citrus—Foliocellosis.*—Satisfactory results were obtained in the control of citrus Foliocellosis by spraying with a solution of zinc sulphate and hydrated lime in water (10 lb. of zinc sulphate, 5 lb. of hydrated lime and 100 gallons of water).

Fig—Rust—Uredo Fici.—Dusting with 300 mesh sulphur was found to be effective in controlling the disease.

11. *Soil fungi.*—The investigation of the biology of soil fungi was carried out on the following lines :

Estimation of the population of the fungal flora in different kinds of soil.

The study of the behaviour of pathogenic and non-pathogenic fungi in the soil under different conditions (1) when a crop is on the ground and (2) when the land is fallow.

12. *Oils as spreaders.*—Spraying experiments were conducted at Michælpatti (Madura district) in the control of grape vine mildew to test the efficacy of coconut, groundnut and neem oils as spreaders and adhesives when used along with Bordeaux mixture. It was found that the oils were effective and could be used with advantage as spreaders.

13. *Palmyra—Bud-rot.*—The Pest Act in respect of palmyra bud-rot was in force throughout the year in the Palghat, Ponnani and Walluvanad taluks in Malabar.

A mild outbreak of the disease occurred in the Tenali taluk, Guntur district and steps were taken to have the disease eradicated.

14. *Paddy—Piricularia—Tanjore district.*—On a representation made by the Mirasdars' Association that the paddy crop was badly affected with this disease this year, a survey was made in the affected area and it was found that the disease had caused considerable amount of damage to the crop due to adverse weather conditions. The variety 'Korangu samba' suffered most.

15. *Routine.*—Seventy-two specimens of diseased plants were received from different parts of the presidency for examination and advice.

Twelve consignments of seed intended for despatch to foreign countries were fumigated.

16. *Special lectures.*—As desired by the Principal of the College I delivered two special lectures to the students of the B.Sc. class.

17. *Publications.*—Two papers were submitted to the symposium on disease resistance held at Coimbatore in October 1935 under the joint auspices of the Association of Economic Biologists and Indian Science Academy—

(i) "Estimation of disease resistance in paddy Blast and Foot-rot" by Mr. K. M. Thomas.

(ii) "Estimation of disease resistance in sugarcane mosaic" by Mr. C. S. Krishnaswami.

18. *Research Council.*—I was elected President of the Research Council for the year 1936.

S. SUNDARARAMAN,
Government Mycologist.

ADMINISTRATION REPORT OF THE RESEARCH ENGINEER, COIMBATORE, FOR THE YEAR 1935-36.

1. *Charge*.—I remained in charge of the section throughout the year except for a period of leave on average salary from 28th September 1935 to 31st October 1935, during which Mr. B. M. Lakshmipathy, Estate Mechanical Engineer, held additional charge of the section.

2. *Ploughs*.—The following sales in the Presidency of approved ploughs are reported for the year, Cooper No. 11, 1,467; Cooper No. 25, 987; Cooper No. 26, 206; Kirloskar No. 14 (same as Cooper No. 11), 56; Kirloskar Gurjar No. 2 (same as Cooper No. 25), 486; making a total of 3,202 ploughs as against a total of 3,203 last year, 2,593 the year before and 1,070 the year previous to that. The sales were for the most part effected through the department's depots as in previous years.

Progress has been made in the development of light ridge ploughs. Several designs have been found on trial in the districts to fully meet requirements, and the question of production will now be taken up with manufacturers.

3. *Water-lifts*.—In regard to water-lifts efforts have been directed during the year to the further improvement of the Persian wheel and circular mhote. There is undoubtedly much room for improvement in the gears of the Persian wheel which transmit the power of the animals to the main horizontal shaft and this remark applies to the most modern and efficient of the present designs. At present the gears, of cast iron, are faulty in design, of crude construction and low grade material, and the method of mounting in most cases of an equally defective character. Such defects assisted by deficient lubrication render the whole gear assembly of low efficiency in the transmission of power, and an attempt is being made to improve the efficiency by the substitution of machine cut gears and tapered roller bearings mounted and totally enclosed in a small and compact oil-filled housing. A sample of the new design of gear assembly is now under construction and will be given a thorough trial during the course of the coming year. Such an improvement is not likely to enhance the cost of the Persian wheel to any considerable extent.

A rahat with buckets of 2-gallons capacity giving an output of 6,000 gallons per hour has been received from Messrs. Bulsar Rahat Manufacturing Co., Poona City, and installed on a ryot's well in the village of Thottipalayam, 35 miles from Coimbatore, where it is now undergoing trial. The design of the rahat follows the usual lines and presents no superior features. The performance will be reported after a sufficient period of trial.

The improved circular mhote designed by the writer in 1930 and referred to in previous administration reports has now completed a three-year trial period at the Agricultural Research Station, Palur, South Arcot district, during which it has given completely satisfactory service and left no doubt as to the marked advantages it possesses over the original form of circular mhote so widely employed in South Arcot district. A number of the improved circular mhotes has recently been constructed with certain refinements in regard to details and is now ready for installation and demonstration on ryots' farms in South Arcot and other districts where high water levels prevail.

It is unfortunate that such a simple and efficient device is restricted in its application to lifts not exceeding 12 feet or so. It could be adapted for greater depths of working though not with convenience, and attempts to do so are not recommended. The greater simplicity, the distinctly higher efficiency and output and the lower cost of the improved design should make a strong appeal to the ryot and it is hoped that demonstration of the lift will lead him to adopt it in preference to the present crude design which in spite of its low efficiency has attained such a popularity in the South Arcot district.

The following figures relate to the swing basket type of water-lift so commonly employed in parts of Malabar and were recorded during tests of this simple device on a number of farms in the Palghat taluk :—

Serial Number.	Lift. (feet)	Capacity of basket. (Gallons).	No. of baskets discharged per hour.	Discharge (gallons per hour).
1	1' — 9"	3.5	1,540	5,390
2	2' — 6"	1.7	1,800	3,060
3	2' — 3"	3.2	1,320	4,224
4	1' — 3"	2.2	1,920	4,224
5	2' — 3"	2.7	1,620	4,372
6	1' — 6"	2.4	1,620	3,888
7	2' — 0"	2.9	1,680	4,872
8	1' — 9"	2.6	1,500	3,900
9	2' — 3"	3.1	1,540	4,854
10	2' — 6"	2.7	1,680	4,536
Average	2' — 0"	2.7	1,622	4,332

The basket is fashioned in the form of a cone from bamboo or palm leaf or some similar material and the cost is negligible. Two men between them swing the basket at the ends of two pairs of strings, in one continuous movement scooping the water up from the lower level and swinging the fully charged basket to the upper level of discharge where at the extremity of the swing the water leaves the basket, and the empty basket is swung back again to the lower level to repeat the cycle.

4. *Turmeric polisher*.—Following the success of experiments last year with an improved mechanical device for the polishing of turmeric, four models of the device of varying capacities were constructed and subjected to extensive tests on ryots' farms in

Gobichettipalaiyam taluk, Coimbatore district, with satisfactory results. In all about 30 tons of turmeric were treated in the four machines in five villages.

The device consists of a horizontally mounted expanded metal barrel which is rotated by hand and the tests have shown that the barrel of 3 feet diameter $\times$ 2 feet long, taking a 70 lbs. charge of boiled and well dried turmeric provided the best combination of efficient action, high output and comfortable working load for two men-coolie operators. With this machine the 70 lbs. charge is polished in five to seven minutes at the normal working speed of 30 R.P.M. of the barrel, and for the finished produce of one acre in the Gobichettipalaiyam taluk comprising an average of 17 pothis of 280 lbs. or 2.1 tons of polished turmeric, the time required for treatment with the same machine has averaged 16 hours or two days each of eight working hours, which is rather more than one ton of polished turmeric per day. The average cost of treatment of the same quantity, 17 pothis, has worked out over the whole period of test at Re. 1-5-3 as against an average cost of Rs. 6-0-4 with the indigenous method in which the turmeric is vigorously shaken in hanging bamboo baskets to which a few rough stones are added as a polishing agent.

The new polishing drum is thus responsible for a saving of Rs. 4-11-0 in the cost of treatment of an acre's produce, or deducting the cost of hire of the machine which may be reckoned at 8 annas per day, the actual saving per acre amounts to Rs. 3-11-0. The polishing drums with which the tests were made were afterwards in demand by the ryots at the rate of hire referred to. The saving is based on a rate of wages of 4 annas per day for men coolies and 2 annas per day for women coolies. The cost of construction of the drum does not exceed Rs. 30.

5. *Rubber-tyred cart*.—Four more rubber-tyred farm carts of various designs have been constructed by the section during the year for the Central Farm, Coimbatore, the Agricultural Research Stations at Nanjanad and Tindivanam, and the Imperial Sugarcane Breeding Station, Coimbatore. All are equipped with the Dunlop steel wheels and axles and bullock-cart tyres, the first with an 8-00 $\times$ 19 set, and the remaining three with 6-00 $\times$ 19 sets. In addition to these a heavy wood-framed cart with 8-00 $\times$ 19 H.S. rubber tyred equipment was designed and built to the order of Messrs. Dunlop Rubber Co. (India), Ltd., Madras, for the purpose of trial in the transport of heavy logs in forest areas.

The seven rubber-tyred carts of various designs and capacities which have been constructed by the section in previous years for trial in the service of the department continue to give the utmost satisfaction, and it is hoped that at least one such cart will be provided during the ensuing year for each of the Agricultural Research Stations.

Comparative speed tests with an ordinary country cart and a rubber-tyred cart carrying a load of 1 ton on a well metalled road have shown an increase of 16.8 per cent in average speed in favour of

the rubber-tyred cart, the average speed of the country cart being 2.44 miles per hour and that of the rubber-tyred cart 2.85 miles per hour. With a $1\frac{1}{2}$ ton load the average speed of the rubber-tyred cart is still in excess of that of the country cart with its load of only one ton. The same pair of average cattle with the same driver were employed throughout the tests on the same piece of road and the animals were allowed throughout to set their own steady pace. The rubber-tyred cart was equipped with a 6-00 $\times$ 19 Dunlop outfit, the maximum carrying capacity of which is specified as 3,580 lbs. The tyres were inflated to the specified pressure of 38 lbs. per square inch. The weights of the empty carts differed by no appreciable amount. These tests are being continued on various classes of roads.

6. *Grain polisher*.—Experiments have been undertaken at the request of the Assistant Agricultural Chemist, Malt Scheme, Agricultural Research Institute, Coimbatore, with the object of devising a simple and effective method for the removal of the yellow seed coat from the grain of the large yellow cholam (*Andropogon sorghum*) with which the malting experiments are being conducted. A simple machine containing a high speed horizontal grinding disc has been devised which effectually solves the problem, entirely removing and separating the dirty seed coat from the sprouted and dried grain leaving the unbroken spherical white kernel which produces on grinding a thoroughly white flour. The experimental machine has been redesigned with the necessary refinements and several samples are now in course of manufacture.

In addition to the treatment of the cholam grain for malt making, the machine has been found effective in the defibration of cotton seed and its performance at such a task will be fully investigated in further tests. Some simple and inexpensive method of removing the fuzz with the object alone of facilitating drill sowing of the seed might be employed with much advantage.

7. *Groundnut decorticators*.—Two hand-powered groundnut decorticators were received for trial, a "Branda System" machine from the makers, Messrs. Atelier de Plombieres, Marseille, France, and the other of English manufacture by Messrs. Richmond & Chandler, Ltd., Manchester, from Messrs. Marshall, Sons & Co. (India), Ltd., Madras.

The former is of novel design employing a sliding container which is drawn by hand backwards and forwards over a flat perforated screen, the nuts in the container becoming shelled in the space between a series of half round cross bars attached to the surface of the screen and a similar series of cross bars in the bottom of the container.

The task of operating the machine was found too strenuous for two men coolies and the handle bars on the ends of the container had to be extended in order to accommodate two coolies at each end. Though trials were made with a variety of screens, the machine failed to give a satisfactory performance due to choking

of the screen. Under the influence of the reciprocating action the ends of the nuts, it would appear, tend to strike too readily into the holes in the screen and those nuts with sufficiently pointed ends become jammed into the holes before decortication. The upper halves of the nuts projecting above the screen become broken off, the lower halves remaining permanently wedged in the screen or until the pressure of the nuts above them force them through the screen. At any instant a large percentage of the holes in the screen is choked in the manner described and the output of the machine is very considerably reduced.

The Richmond & Chandler improved patent sheller employs a series of flexible beaters consisting of stout coil springs, the ends of which are capped with wooden plugs, and rotate in a cylinder the lower half of which contains the shelling plate or screen. This machine effects a very clean shelling with a low percentage of unshelled and broken nuts. The blast of the fan completely separates the husk. With hand operation the beater shaft rotates at a speed of 150 revolutions per minute, and the capacity is only 60 lbs. of nuts per hour which is much below that claimed for the machine. Only one handle is provided however and the task is found very much too heavy for one man cooly. The provision of a second handle on the opposite side of the machine would call for some change in the design though even for two coolies the load would still be uncomfortably heavy.

According to the claims of the makers a power drive may be applied, and on the fitting of a belt pulley giving the specified beater shaft speed of 360 revolutions per minute the machine performed in a very satisfactory manner with a capacity of 2 cwts. of unshelled nuts per hour. The machine has been retained for further test.

8. *Workshop*.—A "Fortuna" power hacksawing machine was added to the machine tool equipment of the workshop during the year, and operates with complete satisfaction.

COIMBATORE,
27th May 1936.

N. G. CHARLEY,
Research Engineer.

(19)

ADMINISTRATION REPORT OF THE CURATOR, GOVERNMENT BOTANIC GARDENS, OOTACA- MUND, FOR THE YEAR 1935-36.

Charge.—Mr. F. H. Butcher, the permanent Curator, was in charge till the 19th February 1936 when he went on leave preparatory to retirement and I have been in charge since that date.

2. *Government Botanic Gardens, Ootacamund*.—(a) *Season*.—The total rainfall was 42.08 inches as against 38.21 inches last year. There were 171 rainy days as against 134 and the heaviest rainfall was 2.35 inches recorded on the 16th of November. The wettest month was as usual October, during which 6.03 inches were recorded. January was the driest with only 0.11 inches of rain. February was equally dry, while March beat the record for seven years with 3.70 inches of rain, which was very welcome after the dry spell of January and February.

The maximum and minimum temperatures ranged between 57° & 82° F. and 31° & 56° F. respectively, the highest temperature being recorded towards the end of November, and the lowest during the first half of January. Slight ground frosts occurred at intervals till the middle of February, but no appreciable damage was done to the plants.

(b) *Condition and maintenance of the gardens*.—The gardens in general were maintained in good condition throughout the year. The numerous flower beds and the long herbaceous borders were planted with suitable annuals and perennials respectively with the result that there were, even during the off-season, some flowers in full bloom, which were very much appreciated by the public. Among the noteworthy plants to thrive well and to attract the attention of the visitors to the gardens, may be mentioned the ten-week Stocks, Sweet-peas, Schizanthus, Petunias, Nicotiana, Gailardias, etc. New or rare perennial plants to flower out of doors during the year were *Primula asthore* with orange yellow flowers and *Primula florindæ* with creamy white flowers, both of which were much admired by the visitors. The following new plants were in bloom under glass :—

Magnolia fuscata.
Bowardia Hogarthi.
Bowardia "Federal Queen."
Bowardia "Duke of York."
Clerodendron splendens.
Campanula Cocillii.
Abutilon (early flowering hybrids).

The two conservatories were kept in good order, being constantly replenished with flower and foliage plants from the nursery glass houses. The outstanding features of the conservatories were collections of Phyllocactus hybrids, Primulas, Petunias, Cyclamen, Cinerarias, different species of Orchids, etc.

The usual routine gardening operations occupied most of the time of the malis employed in the garden. The most important work undertaken during the year was the cleaning and remaking of two silted-up ponds in the centre of the lower part of the gardens. Advantage was then taken to plant up the margins of these banks with suitable ornamental plants and bulbous and herbaceous perennials, which has considerably improved the appearance of this part of the gardens. The two rockeries, one near the Upper Conservatory and another over the Fountain Terrace, were planted with varieties of succulent and creeping plants.

(c) *Nursery work*.—All the seven glass houses and the hardy nursery received the usual attention in the important work of raising plants from seeds and cuttings for furnishing the Conservatories and flower beds, and also for distribution to the general public. Special attention was paid to the raising of carnations and also to the propagation of herbaceous, fodder and medicinal plants. Altogether 15 lb. and 344 packets of seeds were sown and many thousands of plants and seedlings were raised.

(d) *Introduction of plants and seeds*.—Two plants each of the newly introduced *Eucalyptus regnans* and *Eucalyptus gigantea* were planted out in the upper part of the gardens.

The following bulbs were purchased from Messrs. Barr & Sons, London :—

Amaryllis exhibition choice unnamed hybrids, mixed	12
Begonias, large-flowered, single, for pot culture	24
Begonias, large-flowered, double, for pot culture	12
Begonias, Pendula hybrids, mixed	12
Gladioli, exhibition choice, mixed, large-flowered hybrids	200
Gladioli "Prince of Wales", large-flowered hybrids	200
Gladioli Primulinus hybrids	200

The Amaryllis and Begonias have been potted for the use of the Conservatory, and the Gladioli planted out in the flower-beds. Three hundred and eighty-one packets of flower-seeds were also imported on payment for the requirements of the Garden and the Conservatory.

The following is the list of plants, etc., received gratis in exchange from the persons or societies noted against each :—

(1) Mrs. Steele, Ootacamund	1 plant <i>Rondeletia am.</i>
(2) F. Cooke, Esq., Kotagiri	6 bulbs of <i>Lilium lense.</i>
(3) H. E. Browne, Esq., Ootacamund.	100 bulbs of <i>Narcissus.</i> 24 <i>Delphiniums (Red).</i>
(4) Nilgiri Agri-Horticultural Society, Ootacamund.	26 Ornamental plants. 4 Fruit plants.
(5) Agri-Horticultural Society's Gardens, Madras.	9 Ornamental plants.

In addition, 34 packets of seeds were received from different gardens and private individuals as a contribution to the gardens, including 5 packets presented by me.

(c) *Distribution of plants and seeds*.—One thousand five hundred and seventy trees and shrubs, 7,171 seedlings, 318 bulbs and bulbous plants, 563 cuttings, 7,000 "Kikuyu" grass setts, 39 lb. of tree-seeds and 126 packets of flower-seeds were sold. Sixty-six plants, 1,980 seedlings, 36 packets and 132 seeds were supplied gratis or in exchange. Besides, 5 Colleges were supplied with botanical specimens for class work and examination.

(f) *Plant breeding*.—The F-2 generation plants of "*Watsonia beatricis*" X "*Watsonia alba*" have just started to bloom. They have split into four different kinds of flowers, i.e., one white and three distinct shades of pink, all of which are worthy of retention and further propagation. The F-3 seedlings raised from the new *Abutilon* varieties are in flower and the 3 predominant colours are pink, orange and yellow with pink-red veins. Attempts will be made to cross fertilize these seedlings.

The result of cross fertilization of the different species of *Lilium* growing in the gardens was not quite encouraging, as the seed vessels formed did not produce fertile seeds.

(g) *Medicinal plants*.—The cultivation of medicinal plants was extended during the year, among which the following may be mentioned :—

(i) *Ipomoea purga* (*Jalap, a brisk cathartic*).—The 39 lb. of tubers planted last year made satisfactory growth. These were lifted in February, i.e., when the plants were dormant and 140 lb. were obtained. Of this 80 lb. were sold at As. 4 per lb. and the balance was planted in 5 cents of land after applying cattle manure at the rate of 10 tons per acre.

(ii) *Digitalis purpurea* (*Foxglove, a sedative and diuretic*).—The cultivation of this plant will be discontinued in future in accordance with the instructions received from the Director of Agriculture, Madras, as the *Cinchona* department is growing the same on a commercial scale.

(iii) *Lobelia inflata* (Indian tobacco, the source of *Lobelina*, the specific for spasmodic asthma).—The seeds obtained from the United States Department of Agriculture, Washington, were sown and 90 seedlings were transplanted in a portion of the medicinal garden. The plants are growing rather well, in spite of the damage done by cut worms.

(iv) *Barosma betulina* (Buchu, a reputed diuretic and diaphoretic).—The seeds received from the Union of South Africa were sown in February, but only four seeds have germinated. The seedlings are about 2 inches in height and their further growth is being watched carefully.

(v) *Chrysanthemum coccineum* (*Pyrethrum roseum*, the source of insect powder).—The 1,000 seedlings planted out last year in 5 cents, have made very satisfactory growth and started to bloom freely. A start has been made in collecting the flower heads in order to try their efficacy as an insecticide.

(h) *Fodder plants*.—(i) Of the three species of "Salt Bush" seeds received from the Deputy Director of Agriculture, Livestock, and sown for trial last year, only *Atriplex semibaccata* is satisfactory and there are about 300 seedlings, which are reserved for seed purposes. There are only a few seedlings of the other two species *Atriplex Muelleri* and *Atriplex nummularia*. These plants are also propagated by cuttings.

(ii) *Pennisetum clandestinum* (*Kikuyu grass*).—A small plot of this grass measuring 3.75 cents was converted into hay as an experimental measure and this yielded 260 lb. which works out to 6,933 lb. per acre. The hay was rather good in quality and considered to be fit for horse fodder. This grass may be tried with advantage on a commercial scale on account of the good demand for hay in this locality and the shortage of fodder during dry months.

(i) *Other crops*.—(i) *Lupinus termis* (*Edible Lupin*).—Ten and a quarter pound of seeds were collected for further sowing. A sample of the seeds has been sent to the Government Agricultural Chemist, Coimbatore, for estimating the alkaloid in the seed, and the result is awaited.

(ii) *Lupinus angustifolius* and *L. luteus*.—These two selected Russian edible varieties have grown very vigorously and yielded 6½ lb. and 5 lb. ¾ oz. of seeds, respectively, which are kept for further propagation.

3. *Sim's Park, Coonoor*.—(a) *Season*.—The rainfall was 75.76" as against 45.84" the previous year. There were 134 rainy days as against 123, and the heaviest rainfall in a day was 7.69" recorded on the 3rd February. The wettest month was March 1936 during which 11.89" were recorded and the driest January 1936 with only 0.92" of rain.

The maximum and minimum temperatures ranged between 60° and 88° F. and 41° and 65° F. respectively, the highest being recorded on the 3rd May, and the lowest on the 30th November. There was no frost, but the heavy rains caused some damage to the plants.

(b) *Condition and maintenance of the park*.—The flower-beds and herbaceous borders were constantly replenished with suitable annuals and perennials in order to make the park always attractive to the visitors. Fairly extensive improvement works were undertaken in different parts of the park. As the Coonoor Municipality widened the Walker's Hill road at the hair-pin bend opposite the entrance to Lover's Walk, a portion of the hedge on the boundary of the park had to be removed; and the banks within were realigned and planted with *Paspalum* grass setts and clumps of *Moraea iridoides* and *Kniphofia*, with the result that the beauty of the park has been very much enhanced. An old *Juniperus virginiana* (Red Cedar) tree growing near the small ornamental pond was uprooted and the place planted with *Hydrangeas* and other foliage plants. It is proposed to send a sample of the wood to one of the Pencil Factories at Madras to find out its suitability in the manufacture of pencils.

A new rustic arch was erected where two footpaths crossed at right angles and this will eventually be covered with ornamental climbing plants; two other arches were also constructed. A new shrubbery was made on the slope below the herbaceous border on the second terrace by planting various ornamental plants, and another on the bank above the rest-house. Other improvements effected during the year include the planting of succulent and rock plants in the wild garden, hardy ferns, tree ferns and shrubbery, and ornamental plants on the Island and in the vicinity of the small pond.

The silt was removed from the head of the lake and utilized for top dressing the lawns.

A *Frenela* hedge of 150 yards in length was planted in continuation of the existing hedge along the northern boundary of the park.

Plants of *Eucalyptus*, *Jacaranda*, *Pinus* and Himalayan Cherry were planted in different parts of the park and in vacant pits, and several other works of a similar nature were carried out to the improvement of the park in general.

(c) *Nursery work*.—The propagation of the many species of plants required for furnishing the flower beds and shrubberies and for sale to the public, was undertaken in due season in the nursery situated in the lower part of the park and also in the show rooms compound. In all 7,500 cuttings of ornamental trees and shrubs were inserted. The raising of the Standard Roses received special attention, and 136 Rose Standards were budded and 222 Briar Roses were inserted to serve as stock for future budding. During the north-east monsoon all the nursery plants were replanted after the usual application of cattle manure.

A further collection of *Araucaria Bidwillii* seeds was made and sown in the nursery beds in pots, of which 20 have germinated so far.

(d) *Introduction of new plants.*—Among the plants newly introduced in the park are the following :—

Eucalyptus gigantea.
Eucalyptus regnans.
Pinus edulis.
Pinus montezumæ.
Techrium fruitecans.
Geranium clorida.
Leptospermum flavescens.
Watsonia Beatricis Alba.
Abutilon.
Jasminum Rex.
Cupressus burmudiana.
Cupressus lusitanica.
Macleania punctata.
Camellia "Lady Humes Blush."
Araucaria Bidwillii.

Aleurites Fordii (Tung).—There are at present ten plants of this valuable oil yielding tree, which are carefully looked after and manured. They are making satisfactory progress, the tallest being over 10 feet high.

(e) *Distribution of plants and seeds.*—Five hundred and seventy-three herbaceous plants, 45 flowering shrubs, 91 Standard Roses and 42 packets of flower and tree-seeds were sold during the year. Further, large quantities of *Acacia*, *Prunus* and other tree-seeds amounting in all to nearly 10 lb. were collected for distribution. Sixty-five Rose buds were supplied to the Principal, Agricultural College, Coimbatore, 441 flower plants to the Farm Manager, Kasargod, and 60 to the Superintendent, Livestock Research Station, Hosur.

4. *General*—(i) *Secretariat garden.*—As per G.O. Ms. No. 516. Development, dated 1st April 1931, the Curator visited the garden several times during the year and gave suitable technical advice to the Park Sergeant. One thousand six hundred and seventy-nine ornamental plants and seedlings were supplied from the Botanic Gardens, Ootacamund, free of charge for furnishing the flower-beds.

(ii) *Exhibitions.*—As usual two groups of flower and foliage plants were staged at the annual exhibition of the Nilgiri Agri-Horticultural Society, Ootacamund, in May and this was very much appreciated by the public.

(iii) *Repairs.*—The annual repairs to the residential and non-residential buildings both at the Botanic Gardens, Ootacamund, and Sim's Park, Coonoor, were carried out departmentally.

(iv) *Concession rates.*—The concession rates sanctioned in G.O. No. 2585, Revenue, dated 16th November 1916, to the members of the Nilgiri Agri-Horticultural Society, were in operation throughout the year, and the total discount granted was Rs. 242-3-4 as against Rs. 101-0-9 in the previous year.

(v) *Agricultural show rooms.*—The show rooms at Coonoor were open to the public throughout the year and a considerable amount of produce was sold there.

(vi) *Breeding bull.*—The breeding bull "Rainton Sam" stationed at Ootacamund, performed 33 services during the year, of which 2 were re-services.

(vii) *Library.*—Forty-four publications were received gratis and the Gardeners' Chronicle, the Kew Bulletin and the Madras Agricultural Journal were purchased.

The following books were also added to the library :—

(1) *The Living Garden or the How and Why of Garden Life*, by E. J. Salisbury, D.Sc., F.R.S.

(2) *Tropical Planting and Gardening*, by H. F. MacMillan (Revised fourth edition).

(3) *Curtis's Botanical Magazine*, Volume 158 (1935).

5. (i) *Pomological Station, Coonoor.*—The rainfall was 75.76 inches as against 45.84 inches last year.

(ii) *Planting operations.*—One hundred and fifty-one fruit-trees consisting of apples, plums, pears, peaches, oranges, grape-fruits, lemons, grape vines, etc., were planted out during the year besides a large number of cape gooseberry, passion-fruit and tomato seedlings.

(iii) *Crops.*—The total yield of fruits of all kinds was 10,022 lb. against 6,513 lb. last year, the increase being mainly under plums, apples, grape-fruits, persimmons and tomatoes.

(iv) *Nursery work.*—Three hundred and twenty peach seedlings were budded, 330 apples and 59 pears were grafted on to apple and pear stocks, respectively. Eighty-four citrus varieties were grafted by "approach" and 64 buddings of oranges and grape-fruits were also done. In addition, a large number of other miscellaneous fruit-trees were grafted.

The grafting of fruit-trees on to stocks of other genera and species was also undertaken and 70 successful unions of apples and pears, etc., were obtained.

During the year 403 grafted fruit-trees such as apples, plums, peaches, pears, oranges, etc., and 506 fruit-seedlings consisting of figs, grape vines, strawberries, cherimoyers, loquats, etc., were distributed against 413 and 576, respectively, last year.

6. (i) *Burliar Fruit Station.*—The rainfall during the year was 69.40 inches as against 48.49 inches last year.

(iv) *Nursery work.*—Special attention was paid to the raising of stocks for mangosteens. During the year 187 fruit plants of various kinds were grafted. Seven thousand four hundred and twenty-six fruit and economic seedlings were raised. Three thousand nine hundred and sixty-six fruit seedlings, 132 grafts and 149 economic and ornamental plants were distributed during the year as against 1,350, 63 and 39, respectively, in the previous year.

1st May 1936. P. A. NATHAN,
*Officiating Curator, Government Botanic
 Gardens, Ootacamund.*

ENCLOSURE.

Financial statement for the official year ending 31st March 1936.

Particulars.	Government Botanical Gardens, Ootacamund.		Slm's Park, Coonoor.		Pomological Station, Coonoor.		Burlar.		Kallar.	
	Expenditure. RS. A. P.	Receipts. RS. A. P.	Expenditure. Rs. A. P.	Receipts. RS. A. P.	Expenditure. RS. A. P.	Receipts. RS. A. P.	Expenditure. RS. A. P.	Receipts. RS. A. P.	Expenditure. RS. A. P.	Receipts. RS. A. P.
Expenditure— To Salaries and allowances ..	13,265 12 0	..	1,701 15 0	..	1,685 12 0	..	872 1 0	..	872 0 0	..
Upkeep charges— Capital outlay ..	344 11 9	..	9 0 0	..	54 7 0	..	22 15 0	..	28 14 0	..
Working expenses ..	9,541 6 11	..	3,592 11 2	..	2,978 1 10	..	1,476 2 2	..	2,437 3 3	..
Petty construction ..	841 13 4	..	349 12 1	..	24 13 0	..	556 13 0	..	40 12 0	..
and repairs ..	..	..	..	..	..	..	..	..	..	..
Other contingencies ..	452 12 2	..	38 15 0	..	49 2 0	..	15 0 0	..	25 8 0	..
Non-voted— Rates and taxes ..	473 2 0	..	102 2 8	..	13 14 0	..	..	..	..	..
Receipts.— Seeds and plants ..	..	1,601 9 2	..	323 13 0	..	..	..	..	..	..
Flowers ..	..	464 1 8	..	88 9 0	..	..	..	..	..	..
Fruit plants, etc. ..	..	..	..	..	..	..	..	..	..	..
Fruits ..	..	..	..	..	..	..	..	..	..	..
Fruit seeds ..	..	..	..	..	..	..	..	..	..	..
Spices ..	..	..	..	..	..	..	..	..	..	..
Rent— Rest-house ..	..	..	..	74 6 0	..	..	..	..	..	..
Miscellaneous ..	..	305 8 9	..	74 0 0	..	..	..	..	..	..
XXIV B. Stationery and Printing ..	..	20 4 6	..	..	..	..	..	..	..	..
Deduct— Returns ..	..	..	..	..	..	..	..	..	..	..
Total ..	25,019 10 2	2,389 5 1	5,794 7 11	560 12 0	4,506 1 10	1,930 13 8	3,242 15 2	792 7 2	3,604 5 3	1,007 12 5
	Profit.	Loss.	Profit.	Loss.	Profit.	Loss.	Profit.	Loss.	Profit.	Loss.
	..	22,630 5 1	..	5,233 11 11	..	2,575 4 2	..	2,450 8 0	..	2,596 8 16

(20)

ADMINISTRATION REPORT OF THE PROVINCIAL MARKETING OFFICER, MADRAS, FOR THE YEAR 1935-36.

I submit herewith the Administration Report of the Agricultural Marketing Section for the year 1935-36.

2. I was in charge of the section throughout the year under report. Messrs. K. W. Chakrapani Marar, S. N. Venkataramana Ayyar and M. P. Kunhi Kutty continued as Assistant Marketing Officers. The total number of days toured by me and the Assistant Marketing Officers during the year were 110, 109, 137 and 127, respectively.

3. At the joint conference of the Provincial Marketing Officers and the Central Marketing Staff held at Delhi in March 1935, it was decided to include in the scheme of marketing surveys all the important agricultural products, but to ensure thoroughness, the surveys were to be confined to commodities of All-India importance, viz., rice, wheat, groundnut, linseed, tobacco, fruits, milk, and milk products, cattle, eggs, hides and skins. It was also decided at the conference that the marketing staff should concentrate on the marketing survey of crops and that development work like the formation of marketing organizations, etc., be deferred until the results of the survey were available as a sound basis to make a start.

4. The distribution of work among the Marketing and Assistant Marketing Officers during the year were as follows:—

Provincial Marketing Officer.—(i) Marketing survey of rice in the Presidency.

(ii) Supervision and control of the survey of commodities allotted to the Assistant Marketing Officers.

(iii) Direct charge of special and local marketing problems in respect of commodities not included in the programme of the first year.

(iv) Provincial Marketing Board and work connected therewith.

Assistant Marketing Officer, Mr. K. W. Chakrapani Marar.—Marketing survey of groundnut, linseed and wheat.

Assistant Marketing Officer, Mr. S. N. Venkataramanan.—Marketing survey of tobacco and fruits (oranges, pineapple, grapes and bananas).

Assistant Marketing Officer, Mr. M. P. Kunhi Kutty.—Marketing survey of eggs, milk, livestock (cattle and buffaloes) and hides and skins.

5. The marketing survey in respect of the commodities mentioned above were on the following main lines:—

(i) *Supply.*—Total production, imports and exports; seasons of marketing.

(ii) *Demand.*—For export and local consumption; quantitative and qualitative. Seasonal variations and trends.

(iii) *Wholesale prices.*—Trends and periodicity in prices. Market intelligence, etc.

(iv) *Preparation for market.*—Methods of harvesting, cleaning, processing, costs, etc.

(v) *Assembling.*—By producers, village merchants and wholesale merchants; finance of assembling; function of banks and co-operative societies.

(vi) *Grading and standardization.*—Possibilities of grading the produce and standardization of contracts.

(vii) *Conservation.*—The present methods of storage in the producers' holdings, wholesale markets, mills, and ports; possibilities of improving storage facilities.

(viii) *Handling and transportation.*—In ryots' holdings, rail head, markets and ports. Methods and cost.

(ix) *Distribution of produce.*—Wholesale and retail—by producers, village merchants, wholesale merchants and exporters.

(x) *Processing and distribution of products.*—Possibilities of further developments.

(xi) *Seed.*—Present methods of supply and distribution of seed; further possibilities of improved seed production and distribution.

(xii) *Weights and measures.*—Customary units of sale in different districts in respect of different commodities.

6. Even at the first conference of the Marketing Officers it was pointed out by the Marketing Officers of several provinces that the proposed surveys were too comprehensive to be completed in the allotted time with the limited staff available for the work. The monthly progress reports of the Marketing Officers were sent regularly to the Agricultural Marketing Adviser to keep him in touch with the progress of work. The Marketing Staff visited several centres of production and consumption, interviewed over thousand persons engaged in the production, manufacture and distribution of the commodities included in the year's programme. The types of persons, who were enquired, included producers, village merchants, wholesale merchants, railway, municipal and port officers, mill-owners, retailers and banks and co-operative societies, etc.

7. In addition to the marketing surveys of the commodities mentioned above, information was also collected for the reports on Fairs, Markets and Produce Exchanges and Co-operative Marketing of Agricultural Produce. As suggested by the Agricultural Marketing Adviser, the co-operation of local bodies and the

district officers of the Co-operative and the Agricultural Departments has been sought in the collection of data required for the reports on co-operative marketing and fairs and markets. Copies of the synopses relating to these subjects were circulated, and the replies are being received.

8. *Preparation of railway statistics and crop and stock atlas.*—The railway statistics on the movements of commodities covered by the marketing survey were collected and compiled from the registers maintained at the head offices of Madras and Southern Mahratta and South Indian Railways. This was found to be a laborious work and took considerable time of both the executive and the clerical staff. Crop and livestock maps showing the distribution by districts and taluks in the Presidency in respect of all commodities surveyed in the year were prepared and sent to the Agricultural Marketing Adviser.

9. *Final reports of marketing surveys.*—The final reports on the marketing survey of wheat, linseed, eggs, tobacco and groundnuts were submitted to the Agricultural Marketing Adviser to the Government of India, Delhi, as noted below. Copies of these reports were submitted simultaneously to the Director of Agriculture, Madras.

Final report on.	Month in which submitted.
Linseed	January 1936.
Wheat	February 1936.
Eggs	March 1936.
Tobacco	April 1936.
Groundnuts	Do.

The final reports on rice, grapes, bananas and apples, cattle and milk are being written up and nearing completion. All of them will be sent by the end of this month as decided at the conference of Marketing Officers held recently at Delhi. The report on hides and skins is due only in the month of July 1936.

10. *Examination of commercial samples.*—In connexion with work on grade standards, samples of the following commodities were collected from different market centres in the Presidency and sent to the respective officers engaged in the analytical work:—

	Number of samples collected and sent so far.
(i) Rice and paddy	484
(ii) Groundnuts	468
(iii) Tobacco	30
(iv) Hides	100
(v) Genuine groundnut oil	5
(vi) Linseed oil	6
(vii) Gingelly oil	1
(viii) Ghee	2
(ix) Wheat	8
(x) Linseed	4

11. *Maintenance of price records.*—When the Marketing Section began to function, it was found that information was lacking as regards the correct prices of different commodities. Only the retail prices of some of the food-grains were being published once a month in the *Fort St. George Gazette*. Arrangements were made immediately after the formation of the Marketing section to obtain from the District staff of the Agricultural Department and certain branches of the Imperial Bank of India and Chambers of Commerce, a list of weekly prices of important agricultural commodities in the important market centres of the Presidency. Weekly market rates of about 35 commodities are being received and recorded from about 65 sources since past one year. The prices are tabulated and made use of in the preparation of price charts, etc. Proposals were made for making this information available to the public, trade associations and individual merchants by the publication and issue of weekly list of prices current. These proposals are now under the consideration of the Revenue Board. A special weekly return of prices of different varieties of rice in the Cocanada, Nellore, Madras and Shiyali markets is being submitted to the Government with effect from the 6th April 1936.

12. *Some special items of work.*—(i) A scheme for the better marketing of potatoes in the Nilgiris was prepared at the instance of the Registrar of Co-operative Societies.

(ii) Consignments of plums were obtained for the first time from Coonoor Pomological Station as a trial to study their keeping qualities and demand in Madras. Of the three varieties of plums obtained, viz., Shiro, Hale and Aloo-Bokara, the first was in demand most, 'Hale' coming second, and the third had no demand at all owing to its peculiar taste. 'Shiro' was not available in sufficiently large quantities. The subsequent consignments of 'Hale' were badly infested with maggots that the experiment had to be stopped for the season.

(iii) As desired by the Director of Agriculture, Madras, a scheme of sampling villages with necessary particulars for the conduct of crop cutting experiments to estimate the normal yield of major crops and another for assessing the gross and net income from certain money crops in the principal districts of the Presidency were prepared in collaboration with the Statistical Assistant to the Board of Revenue and the Statistician to the University of Madras.

13. *The Provincial Marketing Board.*—A Provincial Marketing Board for the Presidency was constituted by the Government in August 1934 with the Director of Agriculture as Chairman, the Provincial Marketing Officer as the Secretary, the Director of Industries, the Registrar of Co-operative Societies and two non-officials as members. Two meetings of the Board were held during the year at which several subjects of provincial importance were discussed. The programme of marketing surveys adopted at the

Delhi conference was generally approved. The following are some of the main items of work which engaged the attention of the Board :—

- (i) The commercial possibilities of starting small-scale industries like manufacture of beaten rice and pop rice and the preparation of beer, starch, etc., from rice were discussed.
- (ii) The suggestions of the Provincial Marketing Officer regarding the starting of co-operative marketing societies and construction of warehouses for stocking the produce of members of such societies and the granting of short-term loans on standing crops and the produce in store were discussed, and the Government addressed in the matter.
- (iii) At the instance of the Board, the South Indian Railway Company have agreed to lease railway land where available for the purpose of erecting warehouses or godowns to store produce to be conveyed by rail.
- (iv) The question of granting special concession in railway freight for transport of plantains from the main producing centres in the Presidency to Northern India and certain other facilities for their quick and efficient transport was taken up with the Madras and Southern Mahratta and South Indian Railways with the result that the railway freights were reduced from half parcel to one-third parcel rates to certain stations in Northern India like Delhi, Allahabad, Benares, Lucknow, Nagpur, etc., as an experimental measure.

14. *Propaganda, lectures, etc.*—Popular accounts of the work done by the Marketing section were published in the local dailies under instructions from the Director of Agriculture, Madras. As desired by the public, I delivered two lectures at the Young Men's Christian Association, Madras, on "Agricultural Marketing." I also delivered a lecture on "Fruit Marketing in Madras with special reference to oranges" on the occasion of the opening of the Fruit Research Station at Anantarajupet by the Honourable Minister for Agriculture.

15. *Enquiries from the public, etc.*—Enquiries from producers, merchants, trade associations, co-operative societies, officers of the Agricultural and other departments of Government, commercial bodies and railways on the disposal of produce, movements of commodities and other marketing problems have been a special feature after the creation of the Marketing section. There were over fifty such important enquiries during the year and suitable action was taken on them. Among such enquiries, special mention may be made of the following :—

- (i) The Secretary, the Shiyali Taluk Mirasdars' Association, was furnished with detailed information as regards the principal rice-growing areas in the world, the exports from, and the imports of rice, into India.
- (ii) Information on the prices of different varieties of rice in Tanjore district was furnished to merchants in Malabar.

(iii) Full particulars of marketing with addresses of merchants dealing in pepper in Bengal and the Punjab were furnished to the Deputy Registrar of Co-operative Societies, Mangalore, and Mr. Puduval of Taliparamba.

(iv) The Secretary, the Chittoor District Co-operative Bank, and the Deputy Registrars of Co-operative Societies, Bezwada and Rajahmundry, were furnished with a list of dealers in *Gur* in Warangal district.

(v) Particulars as regards the proportion of whole and broken rice in the local as well as imported rices in Madras were furnished to the Collector of Customs, Madras, in connexion with the imposition of duty on foreign broken rice.

(vi) Information on spices (Tukhm Malanga and Ispaghul) marketed in Madras was supplied to the Director of Agriculture, North-West Frontier Province.

(vii) Information on the marketing of pineapples was furnished to the Marketing Officer, Assam.

(viii) Mr. N. M. Kokel of the Indo-Continental Provident Fund Society, Karachi, was furnished with a list of merchants dealing in betel leaves.

(ix) Suggestions for the better marketing of coconuts were made to Konaseema Co-operative Loan and Sale Society Union, Limited, Amalapuram.

(x) Particulars regarding area, yield, etc., of some of the principal commodities—paddy, groundnut, tobacco, cotton, etc.—were furnished to the Assistant Commercial Manager, Madras and Southern Mahratta Railway, Bezwada.

(xi) Information on the marketing of red plantains was furnished to Mr. Hurst Otley, Chennanahalli.

(xii) The Secretary of the Fruit Growers' Association, Vizianagram, was furnished with addresses of fruit merchants in Poona, Bombay, Calcutta, Lucknow, Agra, Benares, Cawnpore, the Punjab and the North-West Frontier Province. He was also supplied with information on the commission and incidental charges, etc., that may have to be incurred in marketing mangoes in those trade centres.

16. *Finance.*—The following shows the budget allotment and the amount expended in the year 1935-36 from the funds provided by the Imperial Council of Agricultural Research.

Imperial Council of Agricultural Research Funds.		
	Budget allotment.	Expenditure.
	RS.	RS.
1 Pay of officers and establishment ..	11,600	11,573
2 Allowances including travelling allowance.	5,100	5,096
3 Contingencies and supplies and services.	2,400	2,400
Total ..	19,100	19,069

Statement of Receipts and Charges of the section from Provincial Fund in 1935-36.

Receipts—		RS.	A.	P.
XXIV. A. Agriculture—Agricultural Receipts—Agricultural Stations.		17	1	9
XXIV. d. Agriculture—Recoveries of overpayments.		0	5	3
	Total	17	7	0
Expenditure—				
34. Agriculture—	a. Agriculture—Transferred—	a. A. Direction—		
1	Pay of officers	7,200	0	0
2	Pay of establishment	1,148	6	0
3	Allowances	2,017	5	0
4	Service postage and telegrams	319	14	3
5	Petty contingencies and supplies and services	230	0	2
	Total	10,915	9	5

17. *Programme of work for the year 1936-37*—(i) *Marketing surveys*.—As decided at the Marketing Officers' Conference held at Delhi recently, the following new commodities will be surveyed in the year 1936-37:—

Cereal and pulse crops.—Barley, bengalgram and maize.
Oilseed crops.—Coconuts, mustard-seed, rape-seed and toria.
Fruit.—Mango.
Vegetable.—Potato.
Special crops.—Coffee.
Animal husbandry products.—(a) Sheep and goats, (b) wool and hair, and (c) ghee and butter.

It was also decided at the conference that reports on (a) Co-operative Marketing and (b) Markets and Fairs should also be completed by the end of 1936.

(ii) *Development work*.—It was stated at the Conference of Marketing Officers held at Delhi recently that certain local Governments were keen on development work, particularly in respect of the commodities for which surveys were completed, and that, if the services of the local marketing staff were employed in that direction, they would not be able to concentrate on the surveys of the new commodities. The Chairman, Sir Bryce Burt, took the view that the development work should commence only after the surveys for all the commodities were completed. He explained that the local Assistant Marketing Officers, who were paid for from the Central grant, should be kept busy with surveys, and that if the local Governments were keen on development work—which in his opinion was premature—they should provide the necessary staff for the purpose. After a discussion, it was agreed that the Agricultural Marketing Adviser to the Government of India should send out a reminder to Indian Provinces and States and that the present staff should not be engaged on development work until the All-India reports on surveys were available for the consideration of the Governments concerned.

MADRAS,
7th May 1936.

K. GOPALAKRISHNA RAJU,
Provincial Marketing Officer.

(21)

**ADMINISTRATION REPORT OF THE SUPERINTENDENT,
AGRICULTURAL RESEARCH STATION, ANAKAPALLE, FOR 1935-36.**

I submit below my administration report for the year 1935-36.

I.—CHARGE.

I was in charge of both Anakapalle Agricultural Research Station and the Sugarcane Research Station at Gudiyattam. M.R.Ry. R. Vasudeva Rao continued to be the Farm Manager in charge of Sugarcane Station at Gudiyattam. Besides visiting Gudiyattam, I inspected the lands of Zamindars of Venkatagiri and Mirzapuram during the year to advise on methods relating to cane cultivation.

II.—AGRICULTURAL RESEARCH STATION, ANAKAPALLE.

Agricultural Education.

2. *The Juvenile Labourer School*.—A separate report on the working of the school has already been submitted. There were on rolls 25 boys at the beginning of the year, against 26 of the previous year. They were examined at the end of the year by the local Deputy Inspector of Schools and the percentage of passes being 68 against 61 of the previous year. The curriculum continues to be the same.

3. *Training of literate lads as labourers*.—Fifteen literate lads whose educational qualifications range from III form to S.S.L.C. continued to work as field labourers.

RESEARCH.

4. *Season*.—The total rainfall recorded during the year under report was only 23.66 inches against 31.78 inches of the preceding year; the average for the past 5 and 23 years being 37.07 inches and 39.85 inches, respectively. The distribution however was not uniform. Hot weather rains completely failed. Showers in south-west monsoon were inadequate. North-east monsoon was distinctly disappointing. The season was, therefore, bad for sugarcane and very disappointing for paddy and millets. The situation was made worse by the heavy and unusual rainfall at a time when the cane harvesting was in full swing. At certain places sugarcane badly lodged and inversion set in seriously. The several adverse conditions from start to finish were responsible for the low yields of sugarcane crop this year.

5. *Paddy*.—An average acre yield of 2,212 lb. of grain and 3,003 lb. of straw was obtained this year against 2,699 lb. of grain and 4,333 lb. of straw of the previous year. Of the thirteen

varieties of paddy and twenty pure lines grown on field scale, Mypali No. 7 recorded the highest yield of 3,276 lb. of grain per acre. Comparative study of Mypali and Bangarutheega strains was in progress and Bangarutheega No. 155 recorded the highest yield. The green manure experiment continued on the same lines and an increased yield of 3.84 per cent obtained over no manure plot is not however significant.

6. *Ragi*.—Work on ragi continued on the same lines as in the past. There were 34 selections of the crop under study and Nos. 355 and 525 are very promising and the latter gave in over 139 plots in the district, an increased yield of 21.7 per cent over the bulk. It is very popular in the southern taluks of Vizagapatam district, and the area is spreading very rapidly.

7. *Sugarcane*.—Sugarcane occupied an area of 21.46 acres as against 21.25 acres of last year. An acre yield of 8,007 lb. of jaggery was obtained as compared to 8,800 lb. of last year. The programme of research work continued on the same lines as in the past, which aims at (1) to improve the crop in the existing areas in all its details and reduce the cost of production to the minimum without detriment to the yield; (2) to extend the crop to areas where ordinarily the same could not be cultivated; (3) to secure a maximum period of crushing for the sugar factories; (4) to study the effect of planting cane during different months of the year on the tonnage and quality of juice.

Hence the varietal study, cultural trials and manurial experiments were so designed as to achieve the object mentioned above.

There were 81 varieties under study during the year while 16 more were received from the Imperial Sugarcane Breeding Station, Coimbatore, thus bringing the total number to 97 at the end of the year. The study of varieties forms a special feature on this station and was continued on the same lines as in previous years. The details of germination, tiller production, rate of growth during different months of the year, habit, duration of cane, and quality of juice, etc., were under study. Co. 213, Co. 313, Co. 281, Co. 243, Co. 411 and Co. 352, were very good at germination. Co. 213, Co. 313, Co. 419 and Co. 421, developed deep roots and resisted drought remarkably well. In point of habit there is none so far to compare with Co. 213, but Co. 421 and Co. 419 are good at habit while Co. 313 a very promising cane is disappointing in this character. The chemical analysis of these varieties during this year due to very adverse seasonal conditions was distinctly disappointing. Early varieties like Co. 313, Co. 281, Co. 351, Co. 373 and P.O.J. 2878, which generally show more than 20 brix during the months of December and January did not go over 16 brix by this time. From all aspects Co. 313, Co. 419, Co. 421, Co. 508, Co. 381 and P.O.J. 2878 showed promise.

Habit study continued on the same lines and the observations recorded in the past revealed no difference in the quality of juice

between lodged and non-lodged canes under well drained conditions. Eight promising varieties were put under test and three rounds of analysis made from February onwards confirmed clearly the observations made in the past.

Of the four promising varieties put under comparison Co. 419 and Co. 313 gave over 30 per cent higher yields than the standard Co. 213.

Monthwar planting of cane continued on the same lines and the results corroborate those of the previous year.

The irrigation experiment, trial of cane on swamp land, continued on the same lines, as in the previous year. Co. 313 topped the list again this year in the early planting of the irrigation experiment and has been giving the highest yields consistently for the last three years, while in the late series Co. 281 fared well closely followed by Co. 313. The growth of all the varieties in swamp trial was satisfactory. Co. 419, Co. 411 and Co. 421, in particular did well and gave the best results.

The ratooning power of different varieties are noted in the experiment conducted for the purpose. Co. 243 and Co. 281 gave good yields in the wet land trial while M.A. 21 and J. 247 fared miserably.

Other experiments of spacing in relation to varieties, manure and irrigation and varieties under different doses of manure, cane nutrition trials, trial of seedlings versus setts, and mill trials of two crushers, Vasant and Sarat of Kirloskar were the other activities regarding this crop, and the results were reviewed clearly in the annual report.

8. *Other crops*.—Work on other important crops in the locality is also done. Fresh importations are made and their general behaviour and duration is studied to note their adaptability to local conditions. Ganti, gingelly, groundnut, cottons, gogu, tobacco, chillies, soya beans, and fodder crops are among those under observation. Among fruit trees citrus is receiving good attention.

Three ganti varieties were grown, local, Poona, and Punjab, and they gave acre yields of 767 lb., 1,168 lb. and 608 lb. of grain respectively. Poona and Punjab varieties are distributed in the district.

Pyrus gingelly gave an acre yield of 227 lb. of grain. The varieties obtained from the Oil Seed Specialist were tried and found not to suit the locality.

Four varieties of groundnut, A.H. 45, Mozambique, Palur and Mauritius were tried on the station and they gave 639, 999, 1,197 and 1,215 lb., respectively, per acre.

Cottons were sown in June and September, and the results are in favour of June crop. Buradapatti has topped the list closely followed by Yerrapatti. Hill cotton noted for its fine quality gave 900 lb. of kappas per acre. Cambodia cotton gave 1,303 lb. of kappas per acre.

Of the gogus (*Hibiscus cannabinus* (tried in the station, P.T. 6 (white gogu) gave 350 lb. of fibre per acre.

Of the varieties tried in tobacco, Havana and Guba (Guntur variety) gave the highest yields closely followed by Hybrid No. 28 of Pusa.

Of the chilly varieties, Cocanada dwarf and Anakapalle Red gave the highest yields closely followed by Lanka Long.

Behrum and Burmese varieties of soya beans were tried on the station.

9. *Livestock*.—Two new pairs were purchased while 7 old animals unfit for work were sold. The progeny of three cows obtained from Chintaladevi now count as twelve and three out of them are kept as breeding bulls.

Poultry.—To the four breeds, White Leghorns, Rhode Island Red, Light Sussex, Black Minorca already maintained in this station, an indigenous breed of Chittagongs and, two pairs of jungle fowls were added to the stock this year. Some country hens were also maintained for grading them with improved breeds and study their progeny.

At the beginning of the year there were 94 birds for all the breeds. During the year 653 were obtained of which 377 were sold, 202 died mostly chicken leaving a balance of 168 birds at the end of the year. Some mortality was due to the outbreak of chickenpox and Pseudo fowl pest. The protection of the stock against fowl cholera and chickenpox, and the isolation of healthy ones at the right time, saved most of the valuable birds.

The total eggs received during the year were 2,402; 720 were obtained from Hosur. Out of this 1,151 eggs were set on the farm and 261 sold for setting, and the rest sold for table.

Among the imported breeds maintained on the station Rhode Island Red thrives better than other breeds. Chittagongs are young pullets and have not started laying. The jungle birds are prolific.

The crosses obtained of Rhode Island Red × Country and White Leghorn × Country have started laying and their behaviour will be studied.

Piggery.—Of the five pigs obtained from Hosur, three are surviving. Two died after giving birth to some piggings which did not survive.

10. *Apiary*.—Bee colonies are being domesticated on the station.

11. *Sericulture*.—The rearing of Eri silk worms was continued on the station during the year, but as there was no demand for the silk or the eggs in the locality, this was given up at the end of the year.

Financial statement of the Agricultural Research station,
Anakapalle, for the year 1935-1936.

	RS.	RS.
Receipts—		
XXIV. (a) Agriculture—Agricultural Receipts—		
(i) Agricultural stations	1,804	
(ii) Miscellaneous receipts	1,026	
(iii) Rent on buildings	28	
XXXIV. (b) Stationery and Printing—		
By sale of village calendars and publications ..	1	
Deposit account of the grants made by the Imperial Council of Agricultural Research ..	3,080	
		<u>5,939</u>
Expenditure—		
34. (a) Agriculture—Transferred—C. Agricultural stations—		
a. C. 1. Pay of officers—Voted	5,313	
" Pay of establishment—Voted	8,147	
" Travelling allowance	425	
		<u>13,885</u>
a. C. 2. Contingencies—Non-voted—Rates and taxes	639	
" Contingencies—Voted—Petty construc- tion and repairs	2,700	
" Other contingencies	801	
a. C. 3. Other charges—Voted—		
" Purchase of dead-stock, livestock, cost of land and buildings	1,290	
" Working expenses	20,933	
" Other petty supplies and services	549	
		<u>26,912</u>
G. Livestock—		
a. G. 3. Other charges—Voted—Maintenance of cattle, etc.	1,198	
		<u>1,198</u>
L. Agricultural schools—		
1. Pay of establishment	270	
		<u>270</u>
2. Other charges—Voted—Contingencies ..	40	
Books and periodicals	49	
		<u>89</u>
U. Sugarcane stations—		
a. U. 1 Pay and allowances of establishment—		
Voted	1,613	
Travelling allowance	1,202	
		<u>2,815</u>

	RS.	RS.
Works, repairs—		
Residential buildings—		
1 Ordinary repairs to residential buildings ..	201	
2 Municipal taxes on buildings ..	321	
		522
Non-residential buildings—		
1 Repairs to breeding bull shed	8	
2 Construction of seedling shed	8	
3 Ordinary repairs to non-residential buildings.	275	
4 Alterations to implement shed	133	
5 Racks and windows for hostel rooms ..	210	
6 Renewing doorways of farm gate	37	
7 Water tank and piping	2,029	
		2,700

III—SUGARCANE RESEARCH STATION, GUDIYATTAM.

In accordance with research on sugarcane sanctioned by Imperial Council of Agricultural Research, the station was started in the middle of February 1935 and an area of 34.64 acres was handed over to us by the Revenue Department. The layout of the area into suitable plots was completed during the year, and a detailed programme of work was drawn up, and since submitted.

The following buildings were constructed during the year:—
Residential buildings.

- (1) Farm Manager's quarters.
- (2) Assistant Farm Manager's quarters.
- (3) Fieldman's quarters.
- (4) Cooly huts.

Non-residential buildings.

- (1) Combined office and store.
- (2) Implement shed and cart-stand.
- (3) Cattle-shed and feed room.

—RESEARCH.

Season.—The year under report recorded a heavy rainfall of 42.54 inches as against 20 years' average of 33.12 inches distributed over 55 days.

Sugarcane.—As there was not sufficient time to prepare land satisfactorily, only an area of 3.60 acres could be immediately prepared and planted with sugarcane in the month of April. Towards the end of August an area of 80 cents were planted with all important varieties of sugarcane for short cropping. Twenty varieties of cane, the seed material of which was obtained from Anakapalle were studied on the same lines as those at Anakapalle. Germination, root-development, growth, habit, flowering, quality of juice, ripening, etc., were studied in all their details. Co. 313, Co. 243, Co. 290 and Co. 373, seem to be promising

under class I conditions while Co. 419, P.O.J. 2878, Co. 407, Co. 408 and Co. 414 are good under class II conditions.

In comparison of varieties two sets were taken up during the year, in one, five varieties of class I type (Co. 213, Co. 313, Co. 281, Co. 243 and Co. 356), while five of class II type (Co. 407, Co. 408, Co. 414, M.A. 21 and P.O.J. 2878) were taken up with J. 247 as control. Under class I conditions Co. 213 gave significantly higher yields than all other varieties followed by Co. 243 and Co. 313. Co. 313 and Co. 243 gave higher yields than J. 247. Under class II conditions Co. 407 and Co. 408 gave higher yields than all others, while P.O.J. 2878 and Co. 414 gave higher yields than J. 247.

Irrigation forms a limiting factor in this tract, and a trial on the lines followed at Anakapalle Research Station, was attempted on the station. Co. 313, Co. 419 and Co. 407 behaved very well under this trial and yields of 44.61 tons, 42.73 tons and 40.34 tons of cane respectively were recorded.

Other crops.—Paddy, ragi, fodder cholam, cambodia cotton, ganti, gingelly are grown under rotation. 2,061 lb. of grain of paddy per acre over an area of 14 acres was obtained, while ragi gave an acre yield of 1,153 lb. grain.

FINANCIAL STATEMENT FOR 1935-36.

RECEIPTS.

	RS.	A.	P.
Amount credited to "Deposits and Advances—Deposit account of the Imperial Council of Agricultural Research—Sugarcane Stations"—during 1935-36.	204	12	5

EXPENDITURE.

U. Sugarcane Station—			
A.U. Pay and Allowances of staff—Voted.			
Pay of establishment	4,658	3	0
Travelling allowances	280	14	0
a. U. 2. Contingencies—Supplies and Services—Voted.			
Capital outlay.			
Cost of buildings	8,099	0	0
Purchase of livestock	9	0	0
Purchase of dead-stock	3,048	9	8
Working Expenses—			
Repairs and upkeep	608	1	0
Maintenance of cattle	1,088	3	9
Cooly labour	2,797	15	4
Miscellaneous Cultivation Expenses	2,027	12	7
Seed and Plants	671	12	5
Manures and Chemicals	429	6	7
Sundries	55	10	0
Contingencies	2,407	0	1
Total	27,856	11	8

21st May 1936.

S. SEETHARAMA PATRUDU,
Superintendent.

J. 211 + N35