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Reports of Subordinate
officers of the
Dept. of Agriculture
Madras
1939-40



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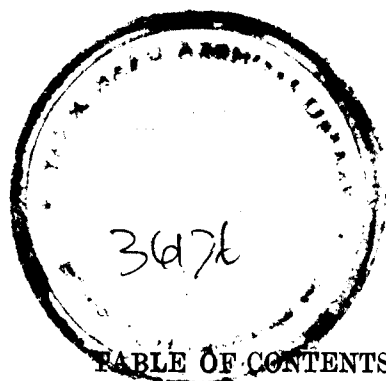


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REPORTS OF SUBORDINATE OFFICERS OF THE DEPARTMENT OF AGRICULTURE, MADRAS, FOR 1939-40.

ADMINISTRATION REPORT OF THE PRINCIPAL, AGRICULTURAL COLLEGE, COIMBATORE, FOR THE YEAR ENDED 30TH JUNE 1940.

Charge.—I continued as Principal throughout the period under report. I attended two meetings of the Academic Council of the Madras University one in September 1939, and the other in February 1940, and two meetings of the Senate, one in October 1939, and the other in March 1940. I was also present at the supplemental convocation in February 1940. I acted as the Chairman of the Board of Examiners in Agriculture for the year 1939-40. I attended the prescribed training course as an active member of the Southern Provinces Mounted Rifles, Auxiliary Force (India), during the year.

2. *Staff.*—Sri M. Kanti Raj continued as Gazetted Assistant to Principal till 12th September 1939, when he was relieved by Sri E. Kunhappa Nambiyar who held the post up to 21st November 1939, after which date the post was abolished under G.O. Ms. No. 2793, Development, dated the 16th November 1939. The post of Hostel Warden and Vice-President of the Students' Club was held by Sri M. Kanti Raj until the 4th December 1939. Sri P. A. Venkateswara Ayyar and Sri H. Shiva Rao took over the duties of Hostel Warden and of Vice-President of the Students' Club respectively from the 5th December 1939.

3. *Tours.*—In March 1940, I visited Kodur Fruit Research Station on the 11th and 12th and the American Arcot Mission (2) Fundamentals, Katpadi, on the 13th and 14th. I was on (By Sri K. Iry and Madras in June 1940, in connexion with culture, I dents for the B.Sc. (Ag.), Class I, 1940.)

—There were some important changes in the Sri K. C. and rules introduced in the year under report. Curzon lectures subject being "ance with the orders contained in G.O. No. 2461, ent, dated the 7th October 1939, Saturday morn-

9. *Students'* teal classes were introduced raising the college ing villages the th 30 to 33 hours. This extension was naturally as usual in Octol

(ii) Under Government Memorandum No. 20412-III/39-2, dated the 12th September 1939, clothing regulations were revised and students were given the choice of regulation dress or Khaddar. Thirteen students only accepted the latter dress.

(iii) In G.O. Ms. No. 858, Development, dated the 18th April 1940, Government restored the privilege of vacation leave to teaching assistants in the Agricultural section, thereby providing a much needed break to what is undoubtedly very heavy class work.

(iv) In G.O. Ms. No. 366, Finance, dated the 7th November 1938, the accounting system for Students' Club and Hostel accounts was revised and separate personal deposit accounts were opened for each section, the former under the Principal and the latter under the control of the Hostel Warden.

In 1939, the College reopened for the B.Sc. (Ag.), Class II and III on the 15th June and the B.C. (Ag.), Class I, was formed on 3rd July. In 1940 also the College reopened for the II and III year classes on the 15th June and the I year class was formed on the 2nd July.

5. *Admissions—1940-41.*—The number of qualified applications received was 194 as against 232 of the previous year. Of the above 138 appeared before the Selection Committee at Rajahmundry, Madras and Coimbatore, and 47 were selected. On the reopening date only 35 students were present and offers were made to the candidates on the waiting list. The Government of Hyderabad wanted to reserve two seats for state students of which one is for a readmitted student. This request was acceded to. The strength of the class on the 18th July 1940 came to 44. The class as divided into linguistic areas and communities is as follows :—

Telugu	...	...	21	Brahmans	...	...	...	20
Tamil	...	...	14	Non-Brahman	...	...	...	9
Malayalam	...	...	3	Muhammadar	...	...	...	4
Kanarese	...	...	4	Backward	...	...	...	10
Urdu	...	...	2	Scheduled	...	...	...	1
			—					—
Total	...	...	44		...	...	...	44
			—					—

6. *Short course—1939-40.*—The following short courses were conducted during the year :—

Name of the course.	Number of students who completed the course.
1 Farm management	* 10
<i>Special Courses.</i>	
2 Malt making	1
3 Horticulture and Vegetable gardening ..	2
4 Insect pests and diseases	2
5 Dairying	† 1
6 Care of animals	3
7 Bee-keeping	3
8 Jaggery making	4
9 Farm implements and machinery ..	3

* Of the ten Farm Management students, nine had their complete training in the special courses items 2 to 9, and one in all except items 7 to 9.

† The student deputed by the Cuddapah Veerabrahmam Dairy Farm, Limited, had his special dairy training from the 10th April to the 25th May 1940.

7. *Short course—1940-41.*—Thirty applications were received for the Farm Management Course of which 28 were asked to join, but only 13 joined the course.

8. *Special lectures.*—The following lectures were delivered at this College under the auspices of the Madras University.

Vacation lectures for rural workers.

(1) Rural Youth and Organization, Rural Education, the University and Rural Life—

(By Dr. DeValois, Principal, American Arcot Mission Agricultural Institute, Katpadi, on the 26th and 27th January 1940).

(2) Fundamental Ideas in Rural Development—

(By Sri K. Unnikrishna Menon, Deputy Director of Agriculture, IV Circle, Coimbatore, on the 27th February 1940.)

Sri K. C. Ramakrishnan, M.A., delivered the Travancore-Curzon lectures on the 24th to the 26th November 1939, the subject being "Economic Factors in Agricultural Development."

9. *Students' tours.*—Besides the week end short trips to adjoining villages the third-year and second-year students had their tours as usual in October 1939 and January 1940, respectively.

10. *Examinations.*—The number of candidates that appeared for the B.Sc. (Ag.) 1940 Examinations and the number passed were as follows:—

		Number appeared.	Number passed.	Failures.	Remarks.
I Examination	..	52	42	10	
II Examination	..	41	31	10	One failed in three subjects, two in two subjects and seven in one subject.
		9 *	4	5	Failed in one subject.
III Examination	..	38	34	4	Do.
		6 *	5	1	Do.

* Referred students of previous years.

11. *Scholarship.*—Five scholarships were awarded to students in the first-year class of 1939-40, two to Muhammadans and three to backward communities. The backward scholarships held by the students B. Srinivasa Rao and R. Narayanamurti having fallen vacant were awarded to G. Ramalingam of Class II and A. G. Kesava Reddi of Class III. The Doctor Rangachari scholarship was awarded to N. S. Parthasarathi of Class I. B. Narayana Reddi continued to receive the Arcot Rajagopala Vellala Scholarship.

12. *College Council.*—Three meetings of this council were held during the year under report.

13. *Estate Committee.*—Besides the usual monthly meetings held in the first week of every month, two special meetings were held one on the 8th September 1939, and another on the 14th May 1940. During the year a sub-committee was formed to revise and amplify the rules of the Estate Committee and the rules as revised by it have since been approved by you.

14. *Miscellaneous.*—The 41st meeting of the Indian Central Cotton Committee was held at Coimbatore from the 15th to the 20th January 1940.

A special meeting of the Gazetted Officers was held on the 15th December 1939, under the orders of the Director of Agriculture, Madras, to advise on the allocation of Gazetted Officers' bungalows in this Estate.

15. *Students' hostel.*—The general health of the students remained satisfactory during the year. Five messes were run during the year and the average attendance and daily rates worked out as follows:—

					Average attendance.	Average daily rates.
						RS. A. P.
General mess	..	..	..	..	31	0 7 7
Telugu mess	..	..	..	..	42	0 7 9
West-Coast mess	..	..	..	..	30	0 7 11
Non-Vegetarian mess	..	..	..	..	30	0 8 8
Special mess	..	..	..	..	26	0 8 6

16. *Students' Club.*—The inaugural address of the club was delivered by Sri M. Bapineedu, M.L.A., ex-Parliamentary Secretary, under the Presidentship of Sri V. V. Giri, M.L.A., ex-Minister. Three general body meetings were convened and three debates were held; besides seven lectures were delivered by distinguished persons who visited the College during the year. The club had the privilege of hearing addresses from Dr. W. Burns and Sir T. Vijayaraghavacharya.

17. The Club Day celebrations were held on the 24th February 1940, when Sri N. Chandrasekhara Ayyar, B.A., B.L., District and Sessions Judge, Salem, presided and distributed the prizes.

18. *Games.*—The students took an active part in all games. Cricket, hockey, foot-ball and tennis were most popular. The College Cricket Team had a successful season winning the local Rhondy Shield for the third time in succession, and reaching the semi-finals in the Inter-Collegiate tournament in which the Madras Medical came out successful. In the local Town Hockey Tournament our College team reached the finals and won the trophy by defeating the Good Shepherds. Three of our students upheld the College sporting tradition at the Inter-Collegiate sports of the Bangalore Division.

19. *College Day and Conference.*—The 28th College Day and Conference was held from the 13th to the 16th July 1939, under the presidency of the Hon'ble Sri V. V. Giri, Minister for Industries and Labour. Medals and prizes were presented to the successful students by the President at the first session of the Conference. An Agricultural Exhibition was also conducted during the Conference which attracted a number of visitors.

20. *Library.*—During the year 742 books and publications and 2,728 periodicals were added to the library, 1,934 periodicals were circulated and 16,150 volumes were issued on loan to local and outside officers. The use of the ticket system was extended to the students' sectional library and nearly 3,000 books were issued during the year. The following publications were published during the year:—

- (1) Author Catalogue—Five-year supplement (1932 to 1937).
- (2) A list of periodical volumes in the library corrected up to 1st May 1938.
- (3) Bibliographical lists on—
 - (a) The budding and grafting of fruit trees with special reference to mangoes and citrus, and
 - (b) the geology, geography and meteorology of the Madras Presidency.

21. *Essential services.*—(i) *Electricity.*—The electrification of the residential buildings on the estate was again deferred. The

cleaning and overhauling of the oil circuit breaker attached to the Central Farm motor which is in charge of the Research Engineer were taken up and completed.

(ii) *Gas supply*.—During the year, 464,300 cubic feet of gas was manufactured and supplied to the laboratories. Three gas retorts and two sets of fireclay fittings were renewed. The work of renewal of the plates of one of the high pressure gas holders was taken up. The remaining gas holders were given three coats of anticorrosive black and red paints.

(iii) *Activated Sludge Plant*.—This plant was working satisfactorily throughout the period under report. Some worn-out minor parts were renewed, and corroded steel and iron fittings of the macerating and aerating tanks, etc., were given a coating of anticorrosive paint.

(iv) *Water-supply*.—The daily average pumping period worked up to 13.43 hours and the daily average consumption to 53,126 gallons. The estate water-supply continued to cause anxiety and complaints regarding defective supplies to residential quarters as well as to students' laboratories in the Freeman Building had to be met by slight adjustments of the hours of supply. It is, therefore, desirable that further action be taken to obtain a supply of Siruwani water on the estate.

22. *Works—(a) Public Works grant*.—The following items of works were carried out departmentally from Public Works Department Civil Works grant under "50-a. Civil Works—Original—Minor":—

- (1) Providing an additional window in each of the 40 rooms of Hostel Long Block.
- (2) Providing iron bars to outside windows in Provincial Bungalow No. 2.
- (3) Providing iron bars to outside windows and an additional window in west bed room in Provincial Bungalow No. 8.
- (4) Providing iron bars to outside windows and an additional window in west bed room in Provincial Bungalow No. 9.

Besides the above, the Executive Engineer, Coimbatore Division, carried out special repairs to cracks in Provincial Bungalow No. 3 and 'A' type quarters No. 7. Annual and special repairs to residential buildings amounting to Rs. 9,664 were done during the year.

(b) *Departmental grant*.—A sum of Rs. 5,200 was spent under the petty construction and repairs grant for carrying out annual repairs to non-residential buildings, roads, etc.

Other items of work of the Civil Engineering Section:—

Estimates prepared	126
Bills prepared	119
Plans drawn	25
Tracings made	28
Blue prints taken	86
Completion reports	32

23. *Museum*.—The museum continued to attract visitors who numbered 17,684 during the year under report. Renewal of labels was done during the year.

24. *Health*.—The general health of the estate was good. There were 19 births and 7 deaths.

25. *Notable and honorary visitors, etc.*—

July 1939—

Hon'ble Mr. V. V. Giri, Minister for Industries and Labour.

Sri P. H. Rama Reddi, I.A.S., Director of Agriculture.

Sri M. Baplnedu, Parliamentary Secretary to the Minister for Administration Reports and Public Information.

Sri P. V. Hanumantha Rao of Panyam, Honorary Visitor.

November 1939—

Monsieur Koesnoto, Agriculturist, Department of Economic Affairs, Batavia.

Dr. J. A. Muliyl, Biological Control Research Officer, New Delhi,

December 1939—

H. M. Hood, Esq., c.s.i., I.C.S., Adviser to His Excellency the Governor of Madras.

Sri P. H. Rama Reddi, I.A.S., Director of Agriculture.

Sri S. P. Ray Choudhari, Agricultural Research Chemist, Dacca.

January 1940—

Members of the Indian Central Cotton Committee.

The Director, Imperial Agricultural Research Institute, New Delhi.

February 1940—

Messrs. Patel and Amin of the Bombay Agricultural department.

March 1940—

Livestock Development Officer, Hosur.

The Second Imperial Entomologist.

ADMINISTRATION REPORT OF THE PRINCIPAL,
AGRICULTURAL COLLEGE

April 1940—

Sri G. Seshadri Ayyangar, B.A., Honorary Visitor.
Mr. J. P. Navarrete, Agricultural Officer, Mexico.

May 1940—

Mr. Z. R. Kothawalla, Imperial Dairy Expert, Bangalore.

June 1940—

Sri P. H. Rama Reddi, I.A.S., Director of Agriculture.
A. R. C. Westlake, Esq., I.C.S., Director of Agriculture.
The Kamal Yar Jung Education Touring Committee consisting of—

- (1) The Hon'ble Mr. M. Azzul Haque, C.I.E., Chairman of the Committee, Speaker, Bengal Legislative Assembly and Vice-Chancellor, Calcutta University.
- (2) Alhaj Moulvi Abul Hassan, I.E.S., ex-Education Minister, and Director of Public Instruction (retired), Kashmir.
- (3) Dr. Abdul Aziz Puri, M.A., PH.D. (London).
- (4) Ali Janab A. Majeed Quraishi, M.A., Professor, Aligarh University.
- (5) Ali Janab Ali Afsal, Bar.-at-Law.

Students of the following institutions visited the college and Research Institute during the year under report:—

September 1939—

Hindu High School, Nurani, Palghat.

Asram English High School, Perumpavoor.

The Presidency College, Madras (Botany Honours Students).

January 1940—

Senior girl students of the London Mission Girls' School, Coimbatore, led by Miss M. E. Wilson.

A batch of medical students undergoing Health Officers' training headed by Dr. K. M. Mathew, Professor of Hygiene, Madras Medical College, visited the Activated Sludge Plant on the 27th April 1940.

COIMBATORE,
30th July 1940.

R. C. BROADFOOT,
Principal, Agricultural College.

ADMINISTRATION REPORT OF THE SENIOR LECTURER
IN AGRICULTURE AND SUPERINTENDENT,
CENTRAL FARM, FOR THE YEAR 1939-40.

Staff.—I was in charge of the post, during the entire period under review.

In the beginning of the year under report, the post of the Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm, was vacant. Sri M. Kanti Raj, Gazetted Assistant to the Principal, was placed in additional charge till 11th September 1939. He was then relieved from the post of Gazetted Assistant by Sri E. Kunhappa Nambiyar and posted as Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm. He continued in the post till 5th December 1939, when he was relieved by Sri C. Ramaswami who reverted from the post of the Deputy Director of Agriculture. Sri M. Kanti Raj was transferred as Assistant Director of Agriculture, St. Thomas' Mount.

On 2nd April 1940, Sri C. Ramaswami was again seconded as Deputy Director of Agriculture and he handed over charge to me and I continued to be in additional charge till 12th April 1940, when I was relieved by Sri M. Kanti Raj. There was no further change in the personnel of the post till the end of the year.

The other changes that happened are indicated below:—

- (a) Sri E. Kunhappa Nambiyar, Farm Manager, Central Farm, went on leave.
- (b) Sri A. Gopalan Nayar was seconded as Assistant Director of Agriculture, Pattukkottai.
- (c) Sri P. K. Natesan, Farm Manager, was transferred as Agricultural Demonstrator, Wardha Training School, Coimbatore.
- (d) Sri K. C. Thomas, Farm Manager, went on leave.
- (e) Sri D. Viswanatha Reddi, Farm Manager, under training, was transferred to Anakapalle.
- (f) Sri V. Karunakaran Nayar, Farm Manager, in charge of College Dairy, went on leave.
- (g) Sri K. Govinda Kurup was posted vice (f).

2. *Veterinary hospital.*—Sri K. Venkataraman, Assistant Lecturer in Animal Hygiene, was transferred and Mr. K. M. Yakub Shah Sahib was posted in his place.

During the year under report, 312 in-patients and 1,606 out-patients were admitted as against 308 and 2,141 patients respectively of last year. The fall in admission in out-patients was

due to the closing of the hospital for about four months, owing to the prevalence of foot-and-mouth disease, in the vicinity. The other chief items of work were :—

	1939-1940.	1938-1939.
Major operations	51	167
Minor operations	98	129
Castrations	145	214

Thirty-nine animals, belonging to different sections, were protected against rinderpest, with goat virus inoculation. There was no mortality. All the Government animals were tested for Johne's disease and tuberculosis, with negative result.

The students of B.Sc. (Ag.), Class I, had 102 hours theory classes and 78 hours practical classes. The students of B.Sc. (Ag.), Class II, had 78 hours theory classes and 127 hours practical classes.

The short course students had 43 hours theory classes and 66 hours practical classes.

3. *Farm Juvenile Labourers' School.*—The strength of the school was 28 and the school worked for 289 days. The average daily attendance was 23 boys. There were 15 admissions and an equal number of withdrawals. There were only two classes and class III was added during the year.

4. *Dairy.*—The herd comprised 37 animals at the beginning of the year, while at the end of the year there were 40 animals. Seventy per cent of the cows in the herd were "in milk." The average yield per cow "in milk" per day was 15.2 lb. (or about 4 m.m.). The maximum daily yield, viz., 38½ lb. (or nearly 10 m.m.) was given by Ayr-Sindhi cross.

The disposal of dairy produce was, as indicated below :—

	Receipts.	Disposal.
	LB.	LB.
(i) Whole milk	111,419	111,419
(ii) Skimmed milk	15,236	15,236
(iii) Cream	1,735	* 1,741
(iv) Butter	984	* 1,009
(v) Ghee	3½	* 5

* Excess belongs to stock brought forward from previous year's account.

5. *Poultry.*—The flock consisted of 105 birds. The average number of eggs laid per month was 12, per bird. The percentage of hatchability was more in the month of September and less in February and March—vide statement below :—

Month.	Number of eggs incubated.	Number of chicks hatched.	Percentage.
September	50	37	74
October	50	34	68
November	104	51	49
February	44	13	29.5
March	50	15	30

6. *Central farm.*—(i) *Season and rainfall.*—The rainfall during the period under review was, as shown below :—

Summary.

	1938-1939.	1939-1940.
Amount of rainfall	14.63"	33.12"
Number of rainy days	57	85

The south-west monsoon was rather late and inadequate. The north-east monsoon was unusually heavy with 17.40 inches of fall. Though not evenly distributed, it was of considerable use to the dry crops. The rains during the hot weather season was more than that of last year. They were very useful to the crops.

(ii) *Experiments.*—In the compost experiment, the relative merit of cattle manure and compost was not significant in the yield.

In the irrigation experiment, arranged in conjunction with the Irrigation Department, maximum yield was obtained by irrigating cholam crop once in "two weeks" by applying "three acre inches" of water per irrigation. In the case of ragi crop, the indications are that good yield can be obtained by irrigating the crop "once a week" with "two acre inches of water," per irrigation.

In sugarcane varietal trial, the yield obtained was, as below :—

		tons of stripped cane.
C.O. 413	61.6	do.
" 419	54.2	do.
" 417	51.8	do.
P.O.J. 2878	40.6	do.

(iii) *Bulk crops.*—The area under bulk crops was very much restricted due to water scarcity.

Soya bean was grown in the previous years in the two Monsoon seasons, but it proved a failure. In this year, it was tried in the hot-weather season and did fairly well. The maximum yield of 794 lb. per acre, was given by Adt. No. 32 variety. The colour of the seed is black and probably this may be a drawback in the market.

Berseem was raised with inoculated seed in December. Two cuttings were taken in March and April and the total yield obtained was 28,123 lb. green leaf per acre. After the second cutting, the roots were badly affected by fungus.

In the wet lands the paddy crop was severely attacked by "Piricularia" and consequently, the grain was not distributed as seed to ryots.

(iv) *Botanic Garden, Orchard, etc.*—A sum of Rs. 97-14-0 was realized by sale of seeds and seedlings at the Botanic garden.

Further planting of fruit trees was not done in the orchard, due to water scarcity. A sum of Rs. 197-10-4 was realized by sale of fruits and grafts.

A sum of Rs. 209 was realized by sale of vegetables.

(v) *Practical training*.—The students of the B.Sc. (Ag.) Degree course and short course were given practical training in Agriculture, Horticulture, Dairying and Poultry Rearing.

(vi) *Work cattle*.—The ration of the work cattle was reduced from 4 lb. to 2½ lb. of concentrates per day.

Their general conditions was seriously affected and therefore it was first raised to 3 and then to 3½ lb.

COIMBATORE,
31st July 1940.

R. C. BROADFOOT,
*Senior Lecturer in Agriculture and
Superintendent, Central Farm.*

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, I CIRCLE, COCANADA, FOR THE YEAR 1939-40 (FASLI 1349).

I.—CHARGE AND STAFF.

Sri B. Ramaiah, Deputy Director of Agriculture, proceeded on leave from 1st July 1939, and Sri M. V. Raghava Rao, Assistant Director of Agriculture, Rajahmundry, held additional charge of the circle from 1st July to 23rd August 1939. I took charge of the circle on 23rd August 1939 and continued to hold the same, for the rest of the period, under report.

The three divisions of the circle were under the charge of the following officers:—

Vizagapatam Division.—Sri P. S. Manian.

Rajahmundry Division.—Sri M. V. Raghava Rao Nayudu.

Guntur Division.—Sri A. Gopalakrishnayya Nayudu from 1st July to 27th November 1939 and Sri R. Swami Rao, for the rest of the period, under report.

Agricultural Research Station, Anakapalle.—Sri A. Ramaswami Ayyar from 1st July to 11th September 1939 and Sri K. Venkatraman for the rest of the period.

II.—AGRICULTURAL EDUCATION.

2. Farm Labourers' School at Anakapalle continued to work during the year, with the juvenile labourers.

3. A few students received practical training in agriculture, on both the Agricultural Research Stations, Anakapalle and Samalkota. Agriculture was included as a subject for study in the High Schools at Vizianagram, Ichchapuram and Bobbili and Horticulture at Pittapuram and Bhimavaram. One hundred and eleven school gardens were inspected by the demonstration staff and suitable advice was given.

III.—DEMONSTRATION.

4. The special scheme sanctioned in G.O. Ms. No. 481, Development, dated 25th March 1935, for five years, for an intensive propaganda and demonstration coming to a close in the year under report, received extension by two more years, with certain modifications, as per G.O. Ms. No. 1539, Development, dated 2nd July 1940.

5. *Season*.—Although the precipitation for the year was above normal, the distribution in the districts of the circle was far from satisfactory.

South-west monsoon.—It was feeble and broke late. Punasa crops suffered a severe handicap. As with the littoral, the agency also suffered equally in the sowings of these punasa crops. Paddy seed-beds got dried up and when resown could not bring any relief to the ryots as they also shared the same fate. The planting of paddy in the uplands under tank ayacuts was poor in extents. Even the standing crops in the deltas and in the upland river basins had improper growth on account of the absence of rains.

The month of September, in the transition, from south-west monsoon to the north-east monsoon ushered in good rains and helped the preparation for and the launching of, of the winter cropping.

North-east monsoon.—This monsoon commenced with extraordinary vigour and the precipitation in October was nearly half of the total output under this monsoon. The tobacco nurseries, the standing crop of paddy in the Kollair areas and groundnut in the harvesting stage was adversely affected in various ways. The pyru sowings of jonna, horsegram, etc., were either caught up in these rains, or delayed till the occurrence of a bright spell. In the Guntur tract, chillies and tobacco were the worst effected and some of the area brought under them had to be supplanted with other crops. Rainfall in November was about the average, and December was practically dry.

Dry weather.—Unusual rains in March favoured pyru gingelly, which was sown from November onwards up to April. These interfered with the cotton pickings and tobacco on the racks under curing.

Hot weather.—This was in utter contrast to the corresponding one of 1938-39. The south-west monsoon broke vigorously in a temporary phase in the month of May. But for the fruit fly appearing in heavy numbers in the wake of this phase of the monsoon and gingelly in the Vizagapatam Division suffering from a heaviness in moisture, this temporary phase of the monsoon was highly beneficial for sowings in the light soils and the preparation for crops in others.

The season of the period under report was disappointing to the upland agriculturists and in the toll it took in reducing crop extents and crop yields to below normal. Sugarcane and gingelly alone were the exceptions to it.

A. CROPS.

(a) Paddy.

6. *Cultural improvement.*—Work in the upland areas to bring down the heavier seed rate in the paddy seed-bed is in progress, the same practice in deltas being quite a common one. The estimated area under this improvement in the circle is 40,162 acres

as against 32,102 acres of the previous year. Planting paddy in singles and doubles, in defect in the uplands relative to the deltas, has also indicated progress under an estimate of 435,840 acres as against 359,259 acres of the previous year. Early preparation of seed-beds with improved ploughs was advocated as usual and the area brought under this improvement was 25,557 acres in the Vizagapatam Division.

7. *Methods of manuring.*—The importance of green manuring with crops like daincha, sunnhemp, indigo, wild-indigo and pillipesara, to recuperate soil fertility, is well realized. The area of the paddy crop which received green manuring in the period under report, was estimated to be 76,154 acres as against 60,356 acres of the previous year. Besides this, an area of 40,960 acres was treated with green leaf in Vizagapatam district. The area treated with phosphatic manures was 2,056 acres.

8. *Multiplication and distribution of paddy seed.*—Departmental types continued to enjoy increasing popularity, P.K. No. 2, in East Godavari, Mtu. No. 3 in West Godavari, Mtu. Nos. 7 and 8 and G.E.B. 24 in the Guntur division maintaining their unique position. The seed available from the Agricultural Research Stations was mostly supplied to the seed-farm ryots, to maintain the quality of purity, side by side with the multiplication of the seed. 1,342.3 cwt. of seed were obtained from the Agricultural Research Stations and supplied to ryots, sufficient to cover an area of 10,221 acres. Notwithstanding an unfavourable season for paddy, 2,162.2 tons of seed were made available for distribution from seed farms (run by the ryots) of 1938-39, sufficient to cover an area of 499,393 acres. The area under seed farms in 1939-40 was 10,247 acres and the quantity of seed obtained therefrom, for distribution, was 2,695 tons.

9. *Other cereals—Ragi.*—This is an important crop in the Vizagapatam district raised in three different seasons. Type Nos. 525 and 355 are in wide spread. E.C. 593 in Markapur and Giddalore and T. 8 ragi in Vinukonda taluk are gaining popularity. There is an area of 6,853 acres under departmental types of the crop, in the year.

Ganti.—The Punjab and Poona varieties continued to be popular in the Vizagapatam district. A few types are under study in the three divisions of this circle. The area under all the types is 1,397 acres, as against 489 acres in the previous year.

Jonna.—Amidst the types in distribution, T. 6 in Bhadrachalam and Kovvur, J. 103 in Guntur, N. 29/68 in Giddalore and N. 28/3 in Markapur are establishing their reputation. There is a total area of 516 acres under the departmental strains. In the Vizagapatam district 3,970 acres were covered with seed, from bulk selection.

(b) *Sugarcane.*

10. *Varieties.*—With the boom in jaggery market, cane cultivation increased greatly. With the spread of suitable types, the old canes like J. 247 and purple mauritius continued to give way to the more promising seedling types, of recent introduction. Besides Co. 213, Co. 419 and Co. 421, the types Co. 365, Co. 243 and Co. 508 are gaining popularity in the Vizagapatam district. In the Vuyyur Factory area, Co. 213, Co. 281 and P.O.J. 2878 which were once popular, have given place to Co. 243 and Co. 313 primarily, which in turn are being replaced by Co. 419 and 421. The total area under all the improved varieties of sugarcane during the year was 47,977 acres, Co. 213 and Co. 419 accounting respectively for 21,871 acres and 10,381 acres.

11. *Seed and cultural improvement.*—The quantity of seed material supplied to the ryots from the Agricultural Research Stations was 333,502 setts, sufficient for 25 acres. With the rapid extension of the types in the ryots' land, the pressure for seed supply from the stations has to some extent been released. An area of 529 acres was under short crop for purposes of supply of seed material and sufficient to cover an area of 2,081 acres under planting. The line planting of cane with wider spacing between the rows, and inter-cultivation with bullock power were other improvements under this head. There were 38,510 acres under line planting and 28,678 acres under wider spacing. The area intercultured with bullock power was 13,809 acres, as against 2,908 acres in the previous year. The heavy increase under this improvement is one more instance to prove the adoption of a better standard of cultivation, in the areas freshly brought under cane.

12. *Introduction of three roller mills and better jaggery manufacture.*—The ryots were helped in the construction of 1,897 improved furnaces for jaggery manufacture, 4,376 demonstrations for preparing jaggery of better kind were conducted. Besides, 42 demonstrations were given in the Vizagapatam Division in the preparation of cream jaggery. The number of improved mills introduced were 219, three of which were power driven.

(c) *Fodder.*

13. Persuading the ryots to grow fodder crops like pillipesara, sunnhemp, sorghum, etc., was continued. Of the several strains released from the Agricultural Research Station, Guntur, J. 75 (bulk) jonna was found to be suitable for fodder, when sown in punasa season. During the year 859 lb. of seed and 176,600 Guinea grass slips were supplied. There was an area of 69,323 acres under introduced fodder crops. Silage was prepared in 11 pits, in the year.

(d) *Fruits.*

14. Fruit cultivation with plantain, mango, citrus, sapota, cashewnut and pineapple is on the increase. Under citrus, sathgudi and santra were introduced, as also new kinds under pineapple and guava. The total area of plantain brought under the improved method of cultivation was 7,196 acres. 1,676 acres out of it were introduced through departmental efforts in the year. 2,642 fruit plants through the departmental medium and 44,656 through other sources were supplied to the ryots.

(e) *Oil-seeds.*

15. *Groundnut.*—There was a fall in area under this crop due to an adverse season. The principal improvement advocated under this crop, viz., the sowing seed in every furrow instead of in alternate furrows (as followed in Vizagapatam district), has covered an area of 80,538 acres in the year as against 44,075 acres in the previous year. The types A.H. 45 and A.H. 25 introduced by the department are gradually losing ground in Guntur Division, due to their late duration, and the weak pod stalk. The area under these two types in the year was 3,552 acres.

(f) *Fibre crops.*

16. *Cotton—Indigenous types.*—The type X 20, under distribution, occupied 90 acres in the circle in the year. Though it is better yielding than the local, it is lacking to a certain measure, in the depth of red colour for which Cocanadas are reputed.

N. 29 released from the Agricultural Research Station, Nandyal, is doing well at Markapur, with its perfectly white lint.

Cambodia cotton.—The quantity of Cambodia cotton seed distributed was 574 lb. covering an area of 40 acres. It is being tried in favoured localities under irrigated conditions.

Patwa gogu.—Trials with this variety in Guntur Division indicated its suitability to the deep black soils with heavy rainfall, when sown early in the punasa season. However it could not be compared in performance with the local red-gogu (*Hibiscus sabdariffa*) on lighter soils.

(g) *Chillies.*

17. Line planting was adopted in Bhadrachalam and Amalapuram taluks to facilitate easy inter-cultivation. One hundred and fifty acres were brought under this improvement in the year. Type No. 390 occupied 9 acres in Pittapuram taluk. In spite of its better yield, its fruit could not be picked free of the stalk and are lower in weight, bulk for bulk, when compared with the local chilli.

(h) Tobacco.

18. The cultivation of cigarette tobacco is pursued with interest in Guntur, Kistna and the Godavari districts, in an area of 101,665 acres. The crop suffered adversely in the nursery as well as on the field; with unusually heavy rains, in the year under report. The popular strain H.S. 9 occupied 5,212 acres. The demand for seed was so great that with the grant of Rs. 300 sanctioned by the Director of Agriculture, 600 lb. of seed was produced under seed-farm conditions. This quantity could not answer 50 per cent of the demand as most of the first sown nurseries died due to "Damping off."

Investigations carried on with oil, from seed of Virginia tobacco (large quantities of which are run to waste from so vast an area as noted above) have shown that it could be used as a semi-drying oil. The percentage of extraction ranged from 25 to 30. The tobacco seed cake is on a par with castor cake in its manurial value, with 5 per cent nitrogen and 2.5 per cent P₂O₅.

B. IMPLEMENTS.

19. There were 8,072 demonstrations with various kinds of improved iron ploughs in the year. 1,185 demonstrations were given with H.M. Guntakas. 3,829 demonstrations were held in orchards with pruning tools. Other demonstrations with Junior Hoe, Buck scraper, Roll Easy Mhote Wheel, Archemidian Screw, Turmeric polisher, Bund-former, Sprayer, Duster, Chaff-cutter, etc., accounted for 2,244. Ridge ploughs and H.M. Guntakas continued to be popular in the Vuyyur sugarcane area as also the Persian Wheel Water Lifts and Pumps driven by Electric motors.

The total number of improved ploughs supplied to ryots in the circle was 379. The sales of other implements and spares are given below :—

Triangular harrows	9
H.M. Guntakas	21
Buck scrapers	2
Bund formers	4
Digging garden forks	27
Persian wheel water lifts	27
Roll easy mhote wheels	67
Improved mhote buckets	109
Archemidian screws	3
Sprayers	5
Chaff-cutters	2
Pruning tools	13
Jaggery pans	199

Turmeric polishing machine	1
Bee-hive boxes	246
Honey extractors	16
Spare parts to ploughs	312
Spare parts to sprayers	5
Others	22

C. LIVE-STOCK.

20. The total number of Bee-hives maintained in the circle was 814 as against 473 in the previous year. This industry is found making good progress in the Rajahmundry Division especially in Pittapuram and Tanuku taluks. The numerous enquiries for supply of hives, honey extractors and other agricultural equipments demonstrations in hivings, honey extractions, etc., were attended to by the departmental staff. The Central Apiary Scheme for Pittapuram sanctioned in G.O. Ms. No. 846, Development, dated 1st April 1939, was continued till the end of the year. Besides creating facilities for detailed studies of bees and bee keeping the Government hives in the scheme yielded a total quantity of 57½ pounds of honey till the end of the year under report. Since Tanuku was also found making good progress in bee keeping with 150 hives spread over 19 villages, a special staff was sanctioned for work in this taluk and the neighbouring taluks of Kovvur and Tadepalligudem, for a total expenditure of Rs. 800 in G.O. Ms. No. 544, Development, dated 6th March 1940, to give an impetus to the industry; the work is progressing.

D. MANURES.

21. (a) The crops recommended for green manuring are dhaincha, wild-indigo, indigo, sunnhemp and pillipesara. The quantity of green manure seeds sold departmentally was 17,741 lb. as against 20,708 lb. in the previous year, while the quantity of seed made available through local production and private agencies was 139.3 tons as against 187.65 tons in the previous year. The fall in outturn in this work was due to the unfavourable south-west monsoon of 1939 for green manure crops preceding paddy.

(b) *Farm-yard manure*.—Better methods of preserving farm-yard manure continued to be one of the important items of propaganda throughout the year. The ryots adopted the following methods in the preservation of manure.

Manure pits and heaps on improved lines.	11,898
Dry earth sheds and litter byres	44,430
Composts	9,796
Night soil composts	925

(c) Artificial manures are being sold by the manure firms through their local agencies. The department is only concerned in giving advice, in the proper use of these manures.

E. PESTS AND DISEASES.

22. *Pest Act operations.*—The Pest Act operations against the *Red Hairy Caterpillar pest* were continued on the same lines as in the previous year, with the special staff engaged for the purpose in Tekkali, Narasannapeta, and Chicacole taluks of Vizagapatam district. The campaign was conducted successfully, with good amount of co-operation from the villagers, and the pest was brought under control in an area of 44,000 acres. Since *Bud-rot of palms* assumed a serious condition in the East and West Godavari districts, and also in parts of the Kistna, the enforcement of the provisions of Pest Act against this disease was continued during the year with a special staff, chiefly of Revenue Inspectors, and in all over a lakh of trees were operated so far. Messrs. Parry & Co., on account of their interest in the sweet toddy industry, in the West Godavari district, came forward with their help, by offering the services of the maistris engaged by them. Due to their co-operation, the sweet toddy area in Kovvur taluk, with the disease at its worst presenting a frightful aspect, could now be practically freed of trees with visible symptoms of the disease. This work though mainly entrusted to the Revenue Department is getting every attention from the Agricultural department. In G.O. Ms. No. 1830, Government enforced the provisions of the Pest Act, for removal of Water Hyacinth in Ramachandrapuram, Amalapuram and Cocanada taluks from 1st August 1939 to 31st January 1941, and the Revenue Department is looking after the clearance operations.

Other pests and diseases tackled.—9,716 acres were sown with jonna seed treated for short smut, as against 4,939 acres in the previous year. Besides the citrus gardens that were getting the close attention of the department in Bezwada area, 3,405 citrus trees were treated outside of this area for various diseases. 1,179 acres of paddy crop, for pests, chiefly case-worm and Fulgorid bug, 947 acres of tobacco for Prodenia, 506 acres for plant lice, 622 coconut trees for stem bleeding disease, 241 acres of vegetable crops for pests chiefly Epilachna, and 243 acres of chilly for thrips were treated during the year. Besides these the Black-headed caterpillar of coconut, citrus bark eating caterpillars, 'Damping off' in tobacco and other seed beds, foot-rot of paddy were the other major pests and diseases dealt with. The Mycology Assistant posted at Bezwada continued his work on Collar-rot, gummosis, and wilts in citrus in Patamata, and Patamata lanka areas. The observations so far made go to show that the desired results with the treatment cannot be obtained with advanced stages of diseases, and it is likely that further study may yield useful results. The control measures against Silver-shoot fly were continued in Chicacole taluk, but the work could not make any progress on account of the drought conditions prevailing and the consequent drying up of the crop.

F. DEMONSTRATIONS AND TRIAL PLOTS.

23. *Demonstration plots.*—Practical demonstrations were conducted on ryots' lands in various crops under (i) varietal, (ii) cultural and (iii) manurial methods. There were 2,693 demonstration plots as against 2,234 in the previous year.

24. *Trial plots—Paddy.*—During the year there were 659 trial plots conducted on paddy, sugarcane, millets, cotton and groundnut. The types BAM. Nos. 1, 4 and 5 from the Rice Research Station, Berhampur, tried in Vizagapatam Division gave enhanced yield ranging from 12 to 15 per cent over the locals. K. 3-A, Adt. 3, Maharajabhogam No. 4 and Pattambi No. 10, also acquitted themselves well with higher yields over controls, ranging from 14 to 16 per cent. In the trial of deep water paddy types in West Godavari, Kavinginpothalai in Bhimavaram and Mtu. 11 in Narsapur fared the best. In two out of three places in the same district Atragada No. 3156 proved superior to other Atragada strains. Dalwa bulk trials with MTU. 9 improved cultural seedlings, proved superior to controls in four out of five places. The same kind of trials with types DH. 57 also proved superior to controls in four out of five places.

Groundnut.—Groundnut AH. 45 and AH. 25 gave respectively 11.7 per cent and 7.2 per cent higher yields over local groundnut in the trials in Vizagapatam district.

Ganti.—Jamnagar, Poona and Punjab ganties gave 27 per cent, 30 per cent, and 13 per cent higher yields respectively over controls in the Vizagapatam Division. Type PT. 700 gave 42 per cent increased yield at Gurzala over the local.

Ragi.—No. 355, VZM. 33, BBL. 5 and No. 525 was the order of performance in the trials with these types in the Vizagapatam Division, with enhanced yields ranging over 9 per cent on controls.

Korra.—Of the types K6, K9 and K10 released from the Agricultural Research Station, Guntur, the trials at Ongole and Markapur proved their superiority over the locals. K6 is easily the best of the selections released.

Jonna.—The types J. 75 and J. 103 released from the Agricultural Research Station, Guntur, proved superior in their performance, to the locals at Markapur and Giddalore.

Sugarcane.—The yield trials with Co. 419, Co. 421, POJ. 2878 and Purple Mauritius conducted in Narasapur taluk indicated the superiority of Co. 419 over the rest. A net profit of Rs. 258-14-5 per acre was received from Co. 419.

G. JOINT WORK WITH OTHER DEPARTMENTS.

25. The sale of jaggery and groundnut through the Co-operative Loan and Sale Societies at Anakapalli and Bimlipatam received the usual attention. Jaggery was the main commodity

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ADMINISTRATION REPORT OF THE

marketed at Anakapalle and groundnut at Bimlipatam. The Sugarcane Growers' Co-operative Societies at Bobbili, Thummampala, Etikoppaka, Kirlampudi and Vuyyur were the organizations closely connected with the Agricultural department, getting the help of four Special Demonstrators. The Bobbili Sugarcane Growers' Society is maintaining a special seed farm for the rapid multiplication of suitable varieties. The controlled credit system for loans on crop culture operated in Peddapuram and Pittapuram taluks receiving the necessary attention from the Demonstrators.

In the Pest Act operations against Bud-rot of palms in East and West Godavari districts and Kistna district there was co-ordination with the Revenue Department. Crop cutting experiments in various crops were conducted along with the Revenue Department. In addition, the village improvement weeks organized on the lines of Surat Scheme in Tanuku and Narasapur taluks got the necessary help from the demonstrators concerned. Assistance was given in the preparation of Poudrette by the public bodies. As members of Elementary Education Advisory Committees, the demonstrators functioned as agents in giving practical instructions to the teachers and pupils, and also helped the schools in running school gardens.

H. AGRICULTURAL ASSOCIATIONS.

26. There were 120 agricultural associations functioning for village improvement during the year. The Vizagapatam District Agricultural Association rendered financial assistance for the awards in the District Agricultural Exhibition conducted at Tekkali. The Pittapuram Honey and Wax Co-operative Society made some progress in its membership, production and sale of honey.

I. AGRICULTURAL EXHIBITIONS AND SHOWS.

27. Twenty-two large scale exhibitions and 102 small scale exhibitions were held during the year in the circle. The most important of these were those held at Tekkali as the annual Vizagapatam District Exhibition, Cocanada in connection with the annual Horticultural Exhibition; Bhadrachalam in connection with the Sreeramanavami festival, Annavaram in connection with the temple Kalyanam festival, Guntur for the Andhra Sabha Conference, and Vuyyur under the auspices of the Vuyyur Industrial and Agricultural Co-operative Society.

J. LECTURES.

28. During the year 95 lectures with magic lantern and 421 ordinary were delivered.

K. PUBLICATIONS.

29. 4,669 villagers' calendars, 448 bulletins and 19 books were sold during the year in addition to free distribution of leaflets.

L. LOANS.

30. During the year 297 Takkavi loans amounting to Rs. 2,376-2-0 were granted for purchase of Cooper Nos. 11, 25, Gurjar, Kirloskar ploughs and other agricultural implements like Mhote wheels, jaggery pans, etc.

M. KOYA UPLIFT SCHEME.

31. The scheme was extended to this year by Government in G.O. Ms. No. 1495, Public (Political), dated 11th September 1940, and as before the working of the scheme was pursued on two main lines (i) helping the agency ryot in tiding over the disabilities resulting from poor economic condition, (ii) demonstrating improved agriculture for getting larger income from the land cultivated and thus creating the necessary incentive for settled agriculture and for improvement of economic condition. The supply of work cattle in the scheme is not much appreciated as the ryots are unable to properly feed them during the summer months when there is acute fodder scarcity. There is also the fear of preying by wild beasts. The implements given to the villages, for common use, are made use of, and the supply of seed for sowing is very much valued, as this saves the ryots from the grip of 'Sowcar' at the most important period of sowing one's crops. The advantage of the various agricultural improvements introduced is being realized by Koyas and there seems to be every hope for the improvement in the economic condition of the agency ryot in the long run, if he is taken care of with patience and perseverance.

IV.—AGRICULTURAL RESEARCH STATION, ANAKAPALLE.

32. *Season.*—The rainfall during the year was 40.34 inches against 40.27 inches the average for the past twenty-seven years. The south-west monsoon was belated and feeble but the north-east monsoon was more sustained in its performance. Cyclonic winds in March 1940 lodged standing crops of mature sugarcane and damaged plantain.

33. *Experimental work—Sugarcane.*—Eighty-five varieties consisting mostly of Coimbatore seedling canes were under observation in various stages of trial. In a preliminary yield test with ten varieties, Co. 419 topped the list with an outturn of 55.44 tons of cane per acre while Co. 411 ranked next with 43.42 tons per acre. Co. 419 under swamp conditions in early and late

planting in a trial with five varieties topped the list with 58.83 and 44.09 tons respectively per acre. Sparked irrigation water had no effect on yield over unsparkled water.

34. *Paddy*.—Eighty-two varietal bulks and 52 strains were under observation. Pure line selections in Ramasagaram, Ramagada and Balaramabhogam were carried on for further trials. In yield trials Navakotisannam No. 4, Mypali No. 7 and Bayyahunda No. 1 proved superior. Green manure at the rate of 3,000 lb. per acre for paddy gave significantly higher yield over 'No manure'. Among seven varieties of dry paddies, Vedurusannam appeared to be promising.

35. *Millets*.—Ragi No. 525 of Anakapalli on the basis of three-year average yield proved to be the best in punasa season which worked out to 2,669 lb. per acre. In the pyru season it proved as good as EC. 593. As a rainfed crop EC. 593 proved to be the best. PT. 499 among the Ganti varieties was the best.

36. *Fruit culture*.—Varietal study of 'Citrus' rootstock trials, scion budding and grafting were the principal items of research. One successful side graft (Alfanzo) was raised adopting Dr. Nankumara's method.

37. *Miscellaneous*.—Tobacco, gingelly, linseed, berseem, soya bean and wheat were the minor crops under trial. The juvenile labourers school worked satisfactorily.

V.—AGRICULTURAL RESEARCH STATION, GUDIYATTAM.

38. *Season*.—A total rainfall of 44.13 inches was recorded during the year as compared to a twenty-five years' average of 34.02 inches. The season was fair to paddy, but the heavy showers in September-October affected cane crop adversely.

39. *Experimental work*.—Sugarcane was the principal crop on which work was concentrated under the ægis of the Imperial Council of Agricultural Research. The different aspects of study pursued comprised varietal observation, maturity studies, yield trials, ratooning trials, wrapping and propping experiments and an investigation into the effect of phosphatic manure on quality of cane juice.

Co. 421 among early varieties and Co. 419 among the late varieties gave maximum yields of 36 tons and 58 tons of cane per acre respectively. Co. 213 proved eminently fitted for ratooning but it was unprofitable to go beyond the second ratoon. J. 247 was found unsuitable for ratooning. In the propping experiment 'propping with bamboo' served the purpose tolerably well. 'Propping with wire' though more effective was costly. Stooking alone did not effectively prevent lodging. Application of phosphoric acid in the shape of Super Phosphate did not appreciably influence the quality of juice.

40. *Miscellaneous*.—Paddy and groundnut were the miscellaneous crops grown on a bulk scale for seed distribution besides cane. The following seed distribution was made during the year:—

Sugarcane seed.	Tons.	Setts.
Co. 419 and Co. 421 ..	48.5	108,625
Paddy seed ..	6.1	
	(13,639 lb.)	

VI.—AGRICULTURAL RESEARCH STATION, SAMALKOT.

41. *Season*.—A total rainfall of 55.15 inches was recorded during the year against 36.63 inches, the average for the past 37 years. Heavy rain in October at a time when paddy was in flower badly lodged the crop with consequent low yields. Sugarcane and plantain as a result of heavy north-east monsoon rains suffered only to a slight extent.

42. *Experimental work—Paddy*.—There were 160 units under observation for further selection in the different varieties. Fourteen setts of yield trials were conducted, in the first crop season. Punasa konamani 12 among konamani selections, PA. 101/2, PA. 117/3, PA. 117/4 among Punasa Akkullu selections; K. 238/2, K. 238/1 among Konamani selections; Nos. 70, 75, 59 and 63 among MTU. GEB. progenies proved superior. In the inter-seasonal trials under the late planting conditions in September and October Co. 2 and Co. 3 did well. In the second crop season MTU. Nallarl 53 and 57 and Kasipichodi 349 did well. Earliness of the semi-wet seedlings claimed under Maruteru conditions was not noted to any useful degree at Samalkota.

43. *Sugarcane*.—Sixty-three varieties were under preliminary study of which 15 were under detailed study for germination, tillering, growth, susceptibility to pests and diseases, arrowing, length of millable cane, weight of cane, chemical analysis and yield. In yield trials Co. 421 among Co. 243, 313, 411, 421 and J. 247; and Co. 419 among Co. 423, 439, 440, J. 247, POJ. 2878, gave the highest tonnages of 36.1 and 63.21 respectively per acre. Yields in spacing trial were more favorable under closer spacing than under wider spacing. Difference between trench and bed plantings of cane were not noted. Application of manure in two or three doses proved better than application in one dose.

44. *Plantain*.—Thirty-eight varieties were under study both in February and June plantings. In the manurial experiment with Karpura Chekkarakeli in February no significant differences in yields were noted in favour of higher doses of manure.

45. *Miscellaneous*.—Sunnhemp for fibre under the auspices of the Imperial Council of Agricultural Research; chillies, wheat, berseem, pineapple, soya beans, red-gram selections, linseed, etc., were under trial.

VII.—AGRICULTURAL RESEARCH STATION, GUNTUR.

46. *Season*.—A total rainfall of 40.51 inches was recorded during the year as against 33.90 inches, the average for the past seventeen years. The south-west monsoon started late, as a consequence sowings were delayed by about a month. North-east monsoon was heavy and concentrated in October which produced too wet a condition to delay pyru sowings. The young crop of chillie received a set back in its growth and tobacco had to be planted twice.

47. *Experimental work*.—Millets, cotton, tobacco, and chillies were the principal crops dealt with under experiments and evolution of types.

48. (i) *Millets*.—In the punasa season jonna Nos. 885, 869 and 916 proved superior to the local in yield trials and the latter two will be given out for district trial in the coming year. Four extra sweet types for fodder proved superior to the bulk. Trials on pyru jonna were not conclusive owing to poor stand.

49. Sajja Nos. 341, 380 and 149 proved superior to bulk in yield trials. In Korra, of the several types examined K. 19, K. 92 of Hagari proved superior to the local, but they were later by a fortnight.

(ii) *Cotton*.—Selection and hybridization work on cotton continued. In the yield trials none of the selections proved desirable.

50. (iii) *Tobacco*.—Improvement of the two common varieties, cigarettes and cigar types was a chief feature of the station. Twenty-three cultures of cigarette tobacco selected on the basis of yield earliness, resistance to mosaic, size, body, colour of leaf were tested and 11 were found promising.

51. (iv) *Chillies*.—Selection of varieties resistant to thrips was in progress. In yield trials No. 1009, 1006, 1010 and 390 proved superior to bulk.

52. *Miscellaneous*.—Groundnut, castor, red-gram, soya beans and berseem were also under study.

COCANADA,
1st August 1940.

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

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, II CIRCLE, CUDDAPAH, FOR
THE YEAR 1939-40 (FROM 1st JULY 1939 TO 30th
JUNE 1940).

I.—CHARGE.

Sri T. Budhavidheya Rao Nayudu was in charge of the II Circle, from 1st to 5th July 1939. Sri R. N. K. Sundaram was in charge from 6th to 31st July 1939. Sri T. Budhavidheya Rao Nayudu took charge from Sri R. N. K. Sundaram on 1st August 1939 and remained in charge of the circle till 28th January 1940. He handed over charge to Sri R. N. K. Sundaram on 29th January 1940 who remained in charge of the circle till 4th April 1940. I took charge of the circle on 5th April 1940 and continued to be in charge till the end of the administrative year.

Sri K. Raghava Chariar was in charge of Cuddapah division till 5th April 1940 except for 15 days from 17th February 1940 when Sri T. Budhavidheya Rao Nayudu, Deputy Director of Agriculture, II Circle, was in additional charge of this division. On the afternoon of 5th April 1940, Sri V. N. Subbanna Charya took charge of the division and remained in charge till the end of the year.

Sri R. N. K. Sundaram was in charge of Nellore division from 1st July to 5th August 1939. Sri T. Budhavidheya Rao Nayudu, Deputy Director of Agriculture, II Circle, was in additional charge from 6th to 13th August 1939. Sri L. Narasimha Chariar was holding charge from 14th August to 3rd December 1939 when Sri A. Gopalakrishnayya Nayudu took charge from him on 4th December 1939 and remained in charge till the end of the year.

Sri V. N. Subbanna Charya was in charge of Bellary division till 27th November 1939. Sri R. N. K. Sundaram took charge from him on 28th November 1939 and continued to be in charge till the end of the year.

Sri A. Gopalan Nayar was in charge of St. Thomas Mount division till 26th August 1939. He handed over charge to Sri T. Budhavidheya Rao Nayudu, Deputy Director of Agriculture, II Circle, on 27th August 1939 who remained in additional charge of the division till 15th September 1939. Sri R. Swami Rao took charge of the division on 16th September 1939 and remained there till 18th November 1939 when he was relieved by Sri A. Ramaswami Ayyar. Sri A. Ramaswami Ayyar was in charge till 12th December 1939 when he was relieved by Sri M. Kantiraj. Sri M. Kantiraj handed over charge of the division on 7th April 1940 to Sri L. Narasimha Chariyar from whom Sri E. K. Nambiar took charge on 19th April 1940 and remained in charge till the end of the year.

The Dry Farming Station, Hagari, continued to be in charge of Sri C. Vijayaraghavan during the whole of the administrative year. The Fruit Research Station, Kodur, was in charge of Sri K. C. Naik throughout the year. The Agricultural Research Station, Nandyal, was under the control of the Assistant Director of Agriculture, Cuddapah, while the Rice Research Station, Buchi-reddipalem and the Panagal Demonstration Farm at Kalahasti were in charge of the Assistant Director of Agriculture, Nellore.

II.—AGRICULTURAL EDUCATION.

Agricultural education received attention in the circle as usual. Twelve candidates underwent training in short course in agriculture for six months in Agricultural Research Station, Nandyal. A batch of ten students from the educated unemployed including a few messengers were also given training in practical agriculture at the Agricultural Research Station, Nandyal. Sri K. Raghava Chariyar, Assistant Director of Agriculture, Cuddapah, delivered three vocation lectures at Chittoor, Saidapet and Anantapur under the auspices of the Madras University. Wherever there are Taluk Educational Committees, the Agricultural Demonstrators have been nominated as members of them. Thirty-seven meetings were attended by the Agricultural Demonstrators in their respective taluks. With a view to give an agricultural bias to the system of education, a scheme for introducing agriculture in the curriculum of the District Board of Cuddapah was drawn up. School gardens were started wherever possible and advice given for their up-keep. One hundred and twenty lectures were given by the Agricultural Demonstrators on Agriculture and allied subjects to the pupil teachers as well as to the students of the higher elementary schools.

III.—DEMONSTRATION.

(1) Season.

The average rainfall for the circle during the year is given below districtwar :—

Districts.	Rainfall in inches. July 1939 to June 1940.			
Nellore	..	..	..	50.32
Cuddapah	..	..	..	29.05
Kurnool	..	..	..	32.19
Bellary	..	..	..	40.53
Anantapur	..	..	..	23.43
Chingleput	..	..	..	37.61
Chittoor (Northern portion)	..	..	..	36.70
Chittoor (Southern portion)	..	..	..	38.22

In Bellary district even though abnormally heavy rains were received during the year, the distribution was erratic. During the first four months of the year there were unusually heavy rains and "Mungari" crop sowings were done in time in both Bellary and Anantapur of Bellary division. Rainfall was deficient subsequently and droughty conditions prevailed till the second week of August. Good rains were, however, received in second and third weeks of August which were beneficial to all standing crops as well as for sowings of 'Hingari' crops. Subsequent rains were favourable for the proper growth of 'Hingari' crops.

In Cuddapah division seasonal conditions were not favourable in the early part of the year. South-west monsoon was inadequate and all the crops suffered from droughty conditions. North-east monsoon rains were, however, favourable for timely sowings of cotton and jonna. The conditions under Kurnool-Cuddapah canal were normal and the cultivation proceeded as usual. In the year 1940 summer started very early and excessive heat was experienced even in February. Very unusually heavy rains were, however, received in May and preparatory cultivations were taken up and pushed through in time. With the showers received in June, planting of turmeric, sowing of green manure crops and other early season crops were commenced.

In Nellore division also rains during summer months and south-west monsoon season were far below the normal. Early sown crops, therefore, suffered very much due to excessive heat and inadequate moisture in the soil. In north-east monsoon season heavy rains were received in time and all the tanks were full. Due to abnormally heavy rains in October and November some of the tanks overflowed and there were a few breaches. Crops, therefore, were damaged to a certain extent. In summer season of 1940 there were good rains which helped the ryots to push through their preliminary cultivations and this was followed by timely rains during south-west monsoon season which enabled the ryots to sow their crops in time.

In St. Thomas' Mount division south-west monsoon rains were inadequate in Chingleput district while it was some what better in Chittoor district. The north-east monsoon rains were late but heavy and naturally the crops that had to be sown late were adversely affected. Though the heavy rains in November filled most of the tanks, the subsequent failure of rains brought down the level of water in tanks and consequently ryots had to bale out water for irrigating their paddy crop. The summer showers of 1940 were, however, favourable followed by timely rains in south-west monsoon season which enabled ryots to take up preparatory cultivations early in the season and sow early crops in time.

(2) *Crops.*

(a) *Cereals*—(i) *Paddy*.—This is the most important crop grown in all the three seasons, i.e., early or Kar, Samba and the late or Navarai in Nellore and St. Thomas Mount divisions and to a lesser extent in Cuddapah division. A number of departmental varieties have become popular in this circle. A number of new strains were tried during the year. As a result of propaganda and demonstration 2,903 acres were grown under improved strains at the instance of the District Work Officers and 67,053 acres have been sown under improved strains by ryots, the seeds for which were distributed by the ryots themselves. In order to cater to the large demands of the ryots for seeds of improved strains as well as to minimize the cost of seeds of such improved strains arrangements have been made to multiply the seed in the circle itself. As a result 51,143 lb. of seeds of improved strains have been distributed departmentally.

(ii) *Cultural improvements*.—The use of suitable labour saving and efficient implements, reduction of seed rate by thin sowing and economic planting formed the chief cultural operations on this crop. In Nellore district the system of double transplanting tried for the last two years has given encouraging results. The principle involved in this system is that the initial sowing of nursery is done in the right season and the growth kept under check by transplanting in a second nursery and finally transplanted in the field when adequate water is received in tanks. Since this is beneficial to the ryots observation plots will be laid out in a number of places throughout Nellore district in the coming year.

(iii) *Green manuring*.—Growing of green manure crops for ploughing them in paddy fields is becoming more and more popular. The green manure crops which are generally advocated by the department to the ryots are dhaincha, indigo, wild indigo, sunnhemp, Pillipesara, etc. In addition to these, green leaf manure is also applied by ryots. This is particularly noticeable in Chittoor district where pungam is largely grown. The department is trying *Glycercidia Maculata* in a few places and the results so far are promising. Demonstrations were also conducted to impress the importance of the application of phosphatic manure in conjunction with green manure.

(b) *Millets*—(i) *Jonna*.—This forms the staple food of ryots in the dry districts of this circle. Improved strains were tried and wherever the strains proved to be better than local jonna, seed was multiplied under seed farm conditions to meet the growing demand. T. 1, T. 6, T. 12, M. 47/3, N. 29/68, N. 28/3, N. 159, N. 223, A.S. 2095, A.S. 1093 and A.S. 1098 were some of the strains which were tried in various parts of the circle. Out of these

T. 1 and M. 47/3 were promising in Bellary division, T. 6, N. 28/3 and N. 29/68 were popular in Cuddapah division, T. 6 and T. 12 were gaining ground as fodder crops in Nellore division while A.S. 1093 and A.S. 1098 found favour in St. Thomas Mount division. During this year 16,246 lb. were distributed and 145,116 acres were under the improved strains.

(ii) *Ragi*.—E.C-593 is the popular variety in this circle. The other strains under trial were E.C. 3517, 3030, 3735, 1507, R. 42 and H. 22. The total area under these improved strains was 1,793 acres and 3,036 lb. of seeds were distributed during the year.

(iii) *Korra*.—Strains K. 23 and K. 68 were under distribution in Bellary division while K. 132 and K. 140 were popular in Cuddapah division. The quantity of seed sold during the year was 1,721 lb. and the area under these improved strains was 6,399 acres.

(iv) *Cumbu*.—P.T. 700, P.T. 701 and P.T. 2229 were some of the strains that were tried in Chingleput and Nellore divisions. Encouraging results were obtained and the area is likely to increase next year.

(c) *Fibres—Cotton*.—Cotton is the chief commercial crop of the Ceded districts.

(i) *Westerns* H.1 is the most popular strain in Bellary district, Proddatur, Jammalamadugu and Pulivendla taluks of Cuddapah district and Pattikonda taluk of Kurnool district. The total area under this strain is 257,712 acres. Seed farms to the extent of 3,116 acres were sown under H.1 cotton in the circle to meet the ever increasing demand for pure seed. In Bellary lint of the seed farms fetched a premium of Rs. 4 per bale over the local while Rs. 3-8-0 per bale was its premium over the local in Cuddapah district. Every acre under this improved strain gave a profit of Re. 1 in Bellary division while in Cuddapah division it gave a profit of Rs. 3 per acre. At this rate the ryots of this circle are profited to the extent of Rs. 2,73,936 which more than covers the annual budget of the entire circle.

(ii) *Northerns*.—N. 14 is the chief strain under distribution. This was sold at a premium of Rs. 20 per candy of 500 lb. over the locals to Messrs. Binny & Co. The quantity of seed distributed during the year amounted to 98,796 lb. and the area under this strain is estimated to be 15,353 acres of which 1,414 acres were under seed farms.

(iii) *Mungari cotton*.—Mungari Strains V. 434, Cross 4383-B and P. 26-H were under trial and observation.

(iv) *Cambodia cotton*.—This crop is becoming popular in Nellore, Chittoor and Chingleput districts in Masipattam season, i.e., in February-March, under irrigated conditions. At the instance of the Cotton Specialist, Uganda Hybrids Nos. 3915,

4383 and 4463 were tried. Due to unfavourable seasonal conditions poor yields were obtained. Co. 2 and X 4383 are, however, doing well. The area under this crop in this circle was 945 acres and 4,394 lb. were sold to the ryots.

(d) *Fruit*.—Cultivation of fruit trees was encouraged and advice on orchard management was given. Methods of planting, manuring, irrigating, pruning and dealing with pests and diseases were explained and demonstrated. The following fruit plants were obtained and supplied to ryots from well established nursery men and Fruit Research Station, Kodur. (Vide Seed Distribution Statement.)

(e) *Oil-seeds*—(i) *Groundnuts*.—A.H. 25 groundnut is gaining ground in the red soil areas of Bellary, Cuddapah and Chingleput divisions. 23,024 lb. of seed of improved varieties were distributed during the year and the area under it was 2,894 acres.

A.H. 45 is a popular strain in Chingleput division and the area was 223 acres and 2,468 lb. seed were distributed.

This crop is however, likely to decrease in area as there is no market due to war.

(ii) *Gingelly*.—S.I. 89, 43, 46 and Tadpatri gingelly were tried in Chingleput, Nellore and Bellary divisions. The results were promising.

(f) *Fodder*.—Efforts to persuade the ryots to grow fodder crops resulted in sowing 9,037 acres under the same. Fodder jonna and Pillipesara occupied the major portion. Guinea grass, elephant grass, Kolakkatai grass were introduced where there were facilities for copious irrigation. Silage making was demonstrated wherever possible.

(g) *Sugarcane*.—Work on sugarcane was carried on as in previous years and many new varieties were tried in various parts of the circle. Co. 419 did well everywhere and it is likely to spread rapidly. In Chingleput division, however, there is a demand for chewing cane in the vicinity of the Madras City and hence Fiji B is popular.

The following are the other items of improvements demonstrated in cane cultivation :—

- (1) Trenching by the use of iron ploughs.
- (2) Selection of disease free setts for planting.
- (3) Minimizing cultivation charges by dispensing with wrapping and propping.
- (4) Planting of tops and adopting of wide spacing.

Jaggery making.—Three hundred and thirty-five demonstrations of jaggery making with the improved Sindewahi furnace were conducted.

Working of Sugarcane Marketing Act.—In the Hospet area in Bellary district the Sugarcane Act was enforced from 5th February to 26th April 1940. This move was very welcome to all concerned since both the ryots and the factory were benefited by fair prices, quick deliveries and regular disposal of canes. The minimum price for all cane varieties was fixed at Rs. 12 per ton.

(h) *Spices*—(i) *Chillies*.—Improved varieties of Guntur chillies were introduced in all the districts except Cuddapah division. The results have been promising and the area is likely to increase under improved strains.

(ii) *Onions*.—Bellary onions were distributed in Chittoor and Chingleput districts and it is becoming popular.

(i) *Drugs and narcotics*—(i) *Tobacco*.—H.S. 9 tobacco from Agricultural Research Station, Guntur, was tried in Nellore and Bellary divisions. In Nellore division the results have been better than local tobacco. Chewing tobacco from Agricultural Research Station, Guntur, was tried in Chittoor district and the results were satisfactory. The area is likely to increase next year.

(ii) *Ginger*.—This crop is mainly confined to Kaluvoy village in Nellore district. Cultivation of this crop is gradually extending under advice to other parts of Nellore district.

(j) *Miscellaneous crops*.—Seeds of miscellaneous crops were also distributed as shown in the seed distribution statement.

(3) Tools and Implements.

The total number of demonstrations conducted with several implements was 5,431 and the sales effected during the year were 3,952 (details furnished in appendix).

(4) Manures.

Work on manures and manuring was carried on, on the following lines :—

(i) *Preservation of cattle manure and conservation of urine* were demonstrated by advocating covering of pits with earth and sheds and introducing dry earth system in cattle-sheds. 10,157 heaps were covered and rectified. Dry earth system was introduced in 1,128 cattle-sheds and conservation of urine by introducing Byre system and pit for urine was introduced in 69 places.

(ii) *Composts*.—Composting of night-soil with municipal rubbish was successfully demonstrated in various municipalities and panchayats of this circle. The following figures give the number of such composts made in this circle : Night-soil compost 201 and habitation waste composts 66.

(iii) *Green manure*.—In view of the shortage of cattle manure, the growing of green manure crops were demonstrated wherever possible. Dhaincha, sunnhemp, kolinji, pillipesara and

indigo are some of the crops grown for green manure. The total area under green manures in this circle was 73,526 acres during the year under report. The quantity of seed supplied by the department is 27,235 lb.

(iv) *Fertilizers and cakes.*—Trade in these manures is in the hands of private companies and the departmental activity regarding their use is merely advisory. With the increase in area under green manures the demand for concentrates is also on the increase.

(5) *Pests and Diseases.*

Propaganda and demonstrations were carried on against all reported diseases. The main insect pests and diseases dealt with were, thrips on chillies, epilachna on brinjals, hairy caterpillar on groundnuts, nephantis on coconuts, cane borer and white ants attack on sugarcane, jassids on jasmine, mildew on roses, aphids and plant lice on citrus, mango hopper on mangoes, wilt on betelvine, panama on plantains. Four experiments were also conducted on the control of wilt on betelvine. Four hundred and sixty-eight demonstrations were conducted and 4,301 packets of fungisulphus and 106 lb. of insecticides and fungicides were sold.

(6) *Pest Act.*

Pest Act was in force in Chingleput division only against hairy caterpillar. The pest appeared in a very mild form which was controlled with the co-operation of the Revenue Department.

(7) *Trial Plots.*

Seventy-five trial plots and 536 observation plots were arranged during the year on paddy, ragi, jonna, korra, chillies, groundnuts, sugarcane, gingelly and cotton. The following were the trial and observation plots arranged in various parts of this circle, as per the statement attached.

(8) *Demonstration Plots.*

Two thousand one hundred and seventy demonstration plots were laid out during the year on cultural, manurial, varietal and other aspects of crop production and also on control methods adopted on various diseases.

(9) *Joint work with other departments.*

Crop cutting experiments were conducted in co-operation with the Revenue Department. The advantages of controlled credit system and loan and sale societies were explained and advocated to the ryots. Assistance was given to the co-operative department in regard to non-credit activities of various kinds. Active part was taken in Rural Welfare celebrations, Health Week Celebrations, etc. The Assistant Directors of Agriculture attended the District Periodical Conferences and took the opportunity of meeting other officers in such meetings. All the Agricultural Demonstrators were members of Taluk Educational Advisory Committees wherever they were existent.

(10) *Conferences, Exhibitions and Shows.*

Eighty-five ryots' conferences and agricultural shows were held during fairs and festivals, health week celebrations, jama-bandi camps and other occasions where mass gatherings were expected. The department put up an exhibition at Sandur in the "Sandur Agricultural Industrial Exhibition" in February 1940 where a first-class certificate of merit was awarded by the Sandur Darbar. In Nellore the department put up an exhibition in the Nellore "District Industrial and Agricultural Exhibition and Cattle Show." A grand exhibition was held at Madras during Christmas holidays under the auspices of the "All-India Khadi and Swadeshi Exhibition" at the Congress House. It attracted large crowds and was a great success, but it was unfortunate that it ended in a big fire.

(11) *Lectures.*

Six hundred and seventeen lectures of which eight with lantern were delivered during the year.

(12) *Loans.*

A sum of Rs. 2,864-12-0 was distributed to ryots in the shape of ploughs and other agricultural implements under takkavi loans.

(13) *Publications.*

The following publications were sold during the year :—

Villagers' calendars	...	...	...	3,005
Bulletins and other publications	...	...	...	117

Leaflets and pamphlets were distributed free in large number.

(14) *Agricultural Advisory Committees.*

This is the second year of the working of these committees. Even though the aim of these committees is to encourage more ryots to take interest in the activities of the department, the response has been very poor. Unless the ryot population gets educated, these committees are not likely to function efficiently and usefully as the whole effort is entirely from the department without adequate response from the ryots. Details of the number of committees and meetings held during the year are noted in the appendix. There were 417 committees and 1,258 meetings were held.

(15) *Miscellaneous.*

Bee-keeping.—The central apiary at Kalrodupalle continued its work. Five hundred and thirty-nine colonies were hived during the year and a total number of 215 colonies are working in the districts. Thirty-seven demonstrations were conducted on honey extraction.

Plant quarantine.—Fourteen consignments of tamarind intended for export to Egypt from Madras were examined, sampled, sealed and passed for issue of export certificates by the Mycology and Entomology demonstrators. Fees collected for the issue of these certificates amounted to Rs. 280. Two consignments of live plants, one intended for Natal and another for Burma were also examined and certified.

Soil improvements and moisture conservation.—To prevent soil erosion and conserve moisture, bunding of both red and black soils was freely advocated and 2,024 acres were bunded and 11.50 acres were worked with basin Lister.

Tree planting.—Six thousand kanuga seedlings and 50 other trees were planted in Bellary division.

IV.—AGRICULTURAL RESEARCH STATIONS.

(1) *Rice Research Station, Buchiredipalem.*

Work at this station was on the following lines. In all 3,840 units were planted—1,670 strip trials, 373 observation plots, 1,332 single plant selections, 240 seed multiplication plots, 7 bulks, 15 district samples and 203 types of miscellaneous selections. Trials of strains and varieties received from other stations are under trial. Selection work on local varieties, such as, Molakolukulu, Kusuma, Krishnakatukulu, Atragada, Vadansamba, Pishanani and Sannavadlu was continued. Trials with new introductions, viz., cultures of Vadansamba, 10,998 and 11,340 are studied. Two thousand seventy-five pounds of paddy seed of important strains were transferred to the districts for distribution to ryots.

(2) *Panagal Demonstration Farm, Kalahasti.*

This farm continued to be a demonstration farm. The main items of demonstration were reclamation of alkaline lands by paying special attention to drainage, cultural operations with iron ploughs and other labour saving implements, growing and ploughing in green manure crops like, dhaincha, sunnhemp, indigo, etc., preparation of vegetable compost, and growing of high yielding departmental strains of paddy, groundnut, cholam, ragi, sugarcane and cotton.

Trials and demonstrations.—Co. 2 and Co. 7 paddy grown in the main season gave encouraging yields of 3,000 lb. per acre. G.E.B. 24 was compared with local Vadansamba under semi-dry conditions and it yielded 161 lb. per acre more than the control which yielded only 489 lb. Vadansamba strains were tried for the first time with local vadansamba as control. Strain No. 5423 proved to be the best of the lot giving an yield of 960 lb. per acre as against 480 lb. per acre—the farm average.

Ragi strains E.C. 593, 3517, 3735, cholam strains A.S. 2095, 1093, cumbu strains P.T. 2229, groundnut strains A.H. 25 and 45, cambodia cotton, Co. 2, sugarcane varieties Co. 419 and P.O.J. 2878 are the other demonstration crops grown on the farm.

Silage and hay-making were successfully demonstrated. The following seed and seed materials were distributed during the year to the districts :—

Paddy seed	..	..	..	5,822 lb.
A.H. 25 groundnut	..	..	..	2,700 „
Ragi strains	..	..	..	1,225 „
Co. 419 sugarcane	..	..	..	40,000 setts.

Three messengers were trained on the farm for a period of three months during the year.

(3) *Agricultural Research Station, Nandyal.*

Season.—The rainfall recorded during the year, i.e., from 1st February 1939 to 31st January 1940 was 26.59 inches spread over 71 days as against the average of 28.31 inches spread over 70 days for the last 32 years. The hot weather rains were scanty and conditions were unfavourable for adequate preparatory cultivation for the early season crops. The distribution of rainfall during south-west monsoon season was not beneficial for early season crops. Jonna and groundnut crops fared well during the year while cotton which had a bad start due to inadequate rains during sowing season pulled up due to heavy rains during North-East monsoon season and gave more than normal yields.

Cotton.—As a bulk crop, N. 14 gave 263 lb. of kapas per acre while N. 23 yielded at 334 lb. per acre. One hundred and eighty-one selections were under row yield trials and 11 of them appeared to be promising. There were 14 selections under purity tests. The varietal differences among the 8 selections under preliminary comparative trials were not significant. Of the six selections under comparative trials, four were found to be better yielders than local and N. 14. A few F 1 and F. 2 and back crosses were grown for making selections.

In a trial plot at Pattikonda, N. 14 and N. 556 were found to be inferior to local while N. 23 was equal to it.

Sorghum.—The yield of the bulk crop of sorghum was 827 lb. of grain per acre, which was very good. One hundred and fifty new selections were sown out of which 50 have been selected for further trials. Of the 24 selections under preliminary comparative trials, only two have yielded more than the local. Out of the seven selections under comparative trials, no definite results were obtained.

In the districts, 12 trials were conducted, 6 in the 'Cheruku' area and 6 in the 'bendu' area. In general, N. 28/3 appeared satisfactory in the 'Cheruku' area and none of the selections tried in the 'bendu' area proved better than the local. The results of the trial on the zone classification were not significant.

Korra.—Fourteen trials were conducted with the co-operation of Agricultural Demonstrators in Cuddapah division. No. 132 strain was reported to have done well in a number of places while No. 140 did well in a few places.

Groundnut.—At the instance of the Imperial Council of Agricultural Research, six selections were compared with the local spreading variety for testing the effect of soil and other environmental factors on the yield and quantity. Nos. 186 and 477 were found to give significantly higher yields than the local.

Rust epidemiology.—Wheat and barley were sown to study the incidence of rust. Rust was not found to be present.

Agronomic experiments.—Experiments on filling cracks in soils with groundnut shells was continued this year. Instead of filling cracks to the saturation point, economic doses were adopted in a new experiment this year. The results were found to give significant increases in jonna grain and straw yields. Applying groundnut shells is not economical at present as the price has gone up due to its use as fuel in factories.

Interculture experiments on cotton.—The results of three years experiments show that the different treatments given have not given significant results.

Green manuring experiments.—This experiment was started to find out the effect of ploughing in green manure on the immediate succeeding crop of jonna with and without superphosphate. The results were not significant.

Silage.—Silage was prepared of fodder cholam and fed to cattle in summer. Attempts were made to ensilage 'bodai' grass but the cattle did not relish it.

Agricultural education.—Short course in agriculture was reduced from eight to six months. Of the 41 candidates admitted, only 12 underwent training throughout the period. Ten others were given training in practical agriculture.

Seed distribution.—The bulk of the farm strains of cotton, jonna and korra were transferred to the districts for sowing under seed farm conditions by the ryots.

Coolie savings bank.—The system of coolie savings bank account continued to be in vogue during the year.

Petty construction and repairs.—A sum of Rs. 630 was spent in repairs to residential and non-residential buildings on the station.

(4) Fruit Research Station, Kodur.

Season.—A total rainfall of 34.85 inches on 58 days was recorded during the year. The distribution was most defective especially during the south-west monsoon when the precipitation amounted to almost half of the mean rainfall recorded in the preceding three years. This combined with an almost complete

failure of the north-east monsoon during 1938, caused an unprecedented drought condition in the tract up to the middle of October 1939, when the position improved. The heavy rains in October and November 1939, however, caused serious damage to the stone revetment put up on the southern bank of Gundleru.

Research—Citrus.—(1) Jamberi and gajanimma have proved so far to be the most vigorous rootstocks for chinee orange, while unworked chinee seedlings have produced the smallest sized trees.

(2) With acid lime scion, jamberi has shown to be the most vigorous rootstock up to this stage.

(3) A rigid selection of kichili and jamberi seedlings in seed and nursery beds has been found to be futile.

(4) 'Electro-culture' has not shown any beneficial effect on growth of acid lime seedlings.

(5) Four varieties of lemons, two of pummeloos and one of kumquats have been found suitable to the tract and are likely to strike the fancy of the growers.

(6) A number of pointers and facts of practical importance to grove culture have emerged from citrus root studies.

Mango.—(1) The extent of polyembryony and percentage of germination in nine varieties have been determined.

(2) Side-grafting in beds with pre-cured terminal shoots of 0.5 cm. diameter or over has produced very high success during certain seasons.

(3) The economic nursery value of root-grafting, budding, inarching, etc., has been ascertained.

(4) Inarching on older rootstocks has been found to possess no advantage.

(5) Progenies of 13 single tree selections possessing off-season bearing tendencies have been planted out.

(6) Some of the double and triple cropping varieties have been isolated from the variety collection plot along with some varieties which produce the choicest quality fruit.

(7) Some relationship between growth and flowering in mangoes has been determined. The origin and nature of development of mixed panicles have been studied and a number of successful crosses have been made.

(8) A large number of tree, leaf, floral and fruit characters of considerable diagnostic value have been found out, and a classification of varieties according to fruit characters has been worked out, incidentally bringing out the existing errors in nomenclature.

Papaya.—Elimination of less desirable trees has been attempted by sib-mating.

Grading machine.—A cheap and new type of grader for chinee oranges has been devised and this has established its usefulness.

Fruit products.—Canned pineapple slices of Kew and Queen varieties, candied citron peel, kumquats and Bangalora mangoes, orange squash, lime and lemon cordial and squash (both pure and carbonated) and dehydrated powder from wild fig are some of the products of good quality prepared during the year.

Publications.—One original paper has been published and another has been accepted for publication.

Exhibitions.—Exhibits were displayed on 17 different occasions at different places.

Education.—Thirteen upper subordinates, 4 maistries, 14 non-stipendiary students and 1 post-graduate student underwent training, as against 35 students in 1938-39, 19 in 1937-38 and 15 in 1936-37.

Nursery.—Six thousand and ten plants and 200 budsticks were sold and the receipts have amounted to Rs. 3,601-12-11 as against the expenditure of Rs. 5,143-1-6. Considering the assets including the plants in stock, the scheme has already proved remunerative. The scheme has also stimulated the growth of private enterprise, and no less than 7 private nurseries have sprung up recently. Eight hundred and eighty-seven enquiries have been received and attended to and 6,100 citrus buds were inserted by the station staff in private nurseries. Requisition for such help and advice is on the increase.

(5) Dry Farming Station, Hagari.

Season.—The total rainfall of the year was 21.30 inches, the average for the past 29 years being 20.68 inches. Of this nearly 75 per cent was received between August and October 1939. It was late and unfavourable for the *mungari* crops like groundnut and italian millet. *Korrapathi* could be sown at its proper season in the middle of August, and this was the only one during past six years, when cotton in that mixture gave good yields. The yields of the *hingari* cotton and Sorghum though not so good as those of 1938-39, have been far above the normal.

Soil Physics.—The distribution of soil moisture in some of the treatments of the agronomic experiments was studied periodically. In the year of heavy rainfall in the *hingari*, treatment differences have not been very graphic as all of them reach the field capacity at sowing. The collection of the run-off of the rainwater and silt was continued. The treatment of scooping in one of the plots into basins has lessened the run-off by nearly 50 per cent of that of the 'unscooped control.'

Ecology and physiology.—Root studies of the types of italian millet and Sorghum and of the main crops in the different treatments of the several agronomic experiments were continued. The

compact panicked Sorghum has a comparatively greater lateral spread, while the loose panicked have their roots going deeper than the former. Doses of farm yard manure like 6,000 lb. and 9,000 lb. per acre clearly promote the development of roots, but there is not much to choose between these two. The manured plants are earlier and a considerable economy of water is in evidence. Wind above a velocity of 10 miles per hour is harmful to *Setaria*.

Studies on the development of the hard layer in the top foot of the soil were continued. Since the season was favourable this phenomenon was noticed later in the season. Experiments with artificial pressure on the roots of the cotton plants to simulate the pressure caused by the shrinking of the clayey drying soil were continued, which corroborate the previous year's observations that the hard layer formed strangulates the cotton roots, consequently the wilting of plants.

Crop improvement—(a) *Sorghum*.—Three of the Bombay types shorter in duration than the locals were superior to the Type 1 in grain while the latter topped the list in straw yield. To evolve drought evading short duration economic white grain types artificial crosses between two of the American Sorghums and the local Type 1 have been in progress. From the 12 F₂s' sixty individuals with the desirable qualities have been selected. Their purity will be tested in the next year. Till then the M. 47-3 Bombay Sorghum which yielded nearly 60 per cent more than the local in a 5-acre plot of the neighbouring cultivator's area will be popularized in the district.

(b) *Setaria*.—The season was unfavourable for the italian millet, the yield trials will be repeated again in the next year.

(c) *Cotton*.—The pure line method having failed to get further improvement over Hagari 1, intensive hybridization has been in progress. Direct crossing has not been fruitful. The F₁'s obtained from Hagari 1 X some of the Berar strains have very good staple length. These will be utilized as parents in other crosses where this is wanting. In the back crosses, where the Hagari 1 blood is increased, the yield gets stabilized. The herbage strain A. 265 has yielded 10 per cent more than Hagari 1 in the yield trials. The results of the trials at Pattikonda have been similar, though the differences have not been significant. This will be tried in a greater number of places in the coming season. The shorter duration X 3915 and X 4383 hirsutum strains were compared with Co. 2 under irrigation. The results have been in favour of the last. In the next season in a complex experiment the interaction of the different time of sowing with these strains will be studied. The environmental effect on Hagari 1 grown in different areas were looked for from six trials. Adoni has the best environment to produce the highest quality of 38 count spinning. With the funds of the Indian Central Cotton Committee

a nucleus of pure Hagari 1 seed was formed by sowing every flower of the plants in 2.25 acres. Six hundred and ten pounds of seed was thus obtained for the station (the inner area) sowings.

(d) *Other crops.*—Besides the multiplication of E.C. 593 and R. 42 ragis, there were yield trials of selections from *Majjiga ragi*, *Palapu ragi*, *Giddu ragi* and *Jadai ragi*. In the next year there will be enough seed for distribution in the several of the above with varying durations. In the wheat trials Bansipalle 808, local and the pusa 4 have yielded alike as in the previous years, but as Bansipalle 808 is slightly earlier it suffers less by rust. Four of the selections from the local bengalgram which were significantly better than the rest last year were not so this year. An examination of the results of the trial of the several safflower selections shows that only four of them have given 5 to 19 per cent more than the control. These will be multiplied for district trials. Among the onions under irrigation, the red bulb types yield more than white bulb ones, but among the seven red bulb types there is nothing to choose. A.C. 22, the best looking of the red types will be multiplied. The trial of Berseem showed that it grows better in the monsoon months when humidity is higher. To see the possibilities of raising sugarcane in a second season from June-July, besides the one from February-March, a preliminary experiment was started. The setts multiplied in this season will be used for a regular trial in the next year.

Agronomy.—In a year of good *hingari* rainfall conditions the bunding has not produced striking results. Due to water stagnation in the lower levels of the compartments when the crop was young there has been seedling deaths, and this has caused lesser yields of cotton and Sorghum straw, yet with lesser number of plants the Sorghum grain return has been 25 per cent more in the bunded. Cotton responds to fallowing far more than Sorghum. The benefit of a fallow even two years ago was visible on cotton, but was not so in similar plots grown with Sorghum. The residual effect of the organic manure has been visible even in the fourth year. Among the variants tried to get at the optimum dose of farm yard manure, the 9,000 lb. dose only was significantly superior to the 5,000 lb. in the case of the direct effect on cereals. In the residual effect studies with cotton the 3,000 lb. dose was equal to 'no manure.' Here again only the 9,000 lb. dose was superior to the 3,000 lb. dose, the other variant with 6,000 lb. dose being equal to the latter. The interculture experiments with cotton has once again shown no differences in yields. With Sorghum the experiment has had significant results in straw return only, the 'five interculturalures' being superior to all except 'four interculturalures.' The latter is better than the 'no interculture—no weeding' which always records the lowest yield. The strip-cropping for a first year has shown that cotton plants in strips have double the growth of those, in the *Karrapathi* mixture.

Livestock.—The Ongole herd of the station which was 48 strong at the beginning became 57 at the end of the year. The Rhode Island Red flock of birds gradually perished in August as a result of the infection of the pseudo-fowl pest.

Red soil experiments at Anantapur.—From 1936-37 for a period of three years with an Agricultural Demonstrator and a fieldman on the lands of willing cultivators near the town of Anantapur, Hindupur and Kadiri cultural experiments have been tried to test if ploughing with an inversion plough and bunding will give better returns from the Anantapur Red Soils than what the cultivator does, viz., ploughing with a wooden plough with no bunded compartments. More than this could not be done in such conditions. In 1939-40 the work was concentrated on a leased area of 43 acres near the town of Anantapur, experiments on the different depths of ploughing, on different sizes of bunds, on the combined effect of manuring and bunding and ploughing with different ploughs, and on the comparison of strip cropping with mixtures were conducted. The season was unfavourable for the early crops. Only in two experiments significant results were obtained. In the experiment when 5 inches, 7 inches and 9 inches high bunds were compared, the 5 inches bunded plots gave higher yield than those from the other bigger bunded. Again in the experiment where ploughing 3 inches, 4½ inches, 5½ inches and 7 inches deep are compared with the respective implements the plots ploughed 7 inches deep with Cooper No. 21 have yielded the highest return of groundnut and the extra cost of deeper ploughing has been economic.

CUDDAPAH,
7th August 1940.

C. RAMASWAMI,
Deputy Director of Agriculture, II Circle.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, III CIRCLE, TRICHINOPOLY,
FOR THE YEAR 1939-40 (FROM 1st JULY 1939 TO 30th
JUNE 1940).

I.—CHARGE.

The Third Circle comprises South Arcot, Tanjore, Trichinopoly, Madura, Ramnad and Tinnevely districts. The following officers were in charge of the circle :—

Sri Y. G. Krishna Rao Nayudu from 1st July 1939, Sri R. N. K. Sundaram from 15th August to 17th November 1939 and Nawabzada Saadat-ul-lah Khan from 18th November 1939 to 30th June 1940.

During the year under report, the post of the Superintendent, Agricultural Research Station, Aduturai, was abolished from 1st September 1939 and from that date the Senior Assistant of the Farm is in charge of the station and under the control of the Assistant Director of Agriculture, Cuddalore.

The four divisions in this circle were under the charge of the following officers :—

Madura Division.—Sri E. Kunhappa Nambiar was holding charge from 1st July to 4th September 1939 and Sri Samuel Jobitharaj from 5th September 1939 to the end of the year under report.

Tinnevely Division.—Sri R. Chokkalingam Pillai from 1st July 1939 to 26th March 1940 and Sri V. T. Subbiah Mudaliyar from 27th March 1940 to the end of the year under report.

Pattukkottai Division.—Sri S. Narayanaiah from 1st July to 21st November 1939, Nawabzada Saadat-ul-lah Khan, Deputy Director of Agriculture, III Circle, in charge from 22nd November 1939 to 11th March 1940 and Sri A. Gopalan Nayar from 12th March 1940 to the end of the year under report.

Cuddalore Division.—Sri R. Swami Rao was in charge of the division till 8th September 1939 and Sri M. Anandan from 9th September 1939 to 30th June 1940.

II.—AGRICULTURAL EDUCATION.

Madura Division.—Agriculture is taught in the two high schools, viz., The Pasumalai High School, Madura, and the Board High School, Usilampatti, as an optional subject. The farms attached to the schools are well equipped.

Tinnevely Division.—The Board High Schools, Koilpatti and Rajapalaiyam, have agriculture as an optional subject.

Horticulture is taught as a manual training subject in the following schools :—

The Rajah's High School, Ramnad; The Schwartz High School, Ramnad; the C.M.S. High School, Srivilliputtur and the St. John's College School, Palamcottah.

Pattukkottai Division.—There is nil.

Cuddalore Division.—The Juvenile School at the Agricultural Research Station, Palur, continued to work satisfactorily. Agriculture as a subject is being taught in the Municipal High School, Villupuram. The Co-operative Agricultural Colonization Scheme of the Annamalai University was working throughout the year with two graduates cultivating 32 acres of wet land and 1½ acres of garden land and each colonist was able to get an average monthly income of Rs. 27. It is hoped that this amount will increase by adopting all possible improvements. A third colonist, a graduate of the Annamalai University joined the scheme at the close of the year.

III.—DEMONSTRATIONS.

(1) Season.

The total rainfall for the year was a little above normal except in Tinnevely district. The south-west monsoon was a bit late but the rains in July and August were helpful for the sowings of dry crops. As the precipitation of the monsoon in Tinnevely was poor the main crop kar paddy suffered. The wet land cultivation progressed well in the Project areas of Madura, Trichinopoly and Tanjore. The north-east monsoon was heavy throughout the circle during the periods of October and November. The very heavy rains in November caused floods in Trichinopoly and Tanjore districts causing some damage to paddy crops, and the dry crops suffered on account of excessive moisture. In Ramnad district many tanks breached and as a result water could not be stored for paddy crops. Due to the rains in April and May, dry cottons had a good summer flush and it was favourable for the preparation of dry lands. On the whole the season was not quite favourable for wet and dry crops due to rainless start, and subsequent inundating rains followed by a rainless season from December to March except for cottons.

(2) Crops.

(a) Cereals.

Paddy.—The improvements consisted in the introduction of new strains, extending the area under the various strains already distributed, economic planting and green manuring.

In Madura division (Madura and Trichinopoly districts) Adt. 3, Adt. 9, Adt. 11, GEB. 24, Co. 1, Co. 2 and Co. 7 have become very popular.

In Tinnevely division (Tinnevely and Ramnad districts) Co. 2, Co. 8 and Co. 9 have become popular. Co. 12 is just being introduced in the place of Senthinayakam.

In Tanjore district (Cuddalore division) the popular strains are Adt. 1, Adt. 2, Adt. 6, Adt. 7, Adt. 10 and Adt. 11 for the samba and Adt. 3 and Adt. 4 for kuruvai.

In Pattukkottai division (C.M.P. area) Adt. 1, Adt. 2, Adt. 8, Adt. 10 and Adt. 11, GEB. 24 and Co. 2 are popular for samba and thalady and Adt. 3 and Adt. 16 for kuruvai.

In Cuddalore division (South Arcot district) P.L.R.I., Adt. 2, Co. 2 and GEB. 24 are popular for samba and Adt. 9, Adt. 12 and Adt. 3 are popular for kuruvai season. As there is a great demand for departmental strains, great effort was made to meet the demand from seed-farms run by ryots and by the department.

Two lakhs, fifty-two thousands, two hundred and fifty-two pounds of seeds were distributed by the department.

The area covered by these improved strains including natural spread is estimated at 968,544 acres.

Several paddy strains are also under trial to find out if they suit different localities of this circle.

Economic planting.—The importance of thin sowing of nurseries and economic planting are constantly advocated and demonstrated and they are also well realized by the ryots. Economic seed-rate was used in 795,547 acres.

Special propaganda work was carried out on an intensive scale in Tanjore taluk employing 8 special maistris to actually demonstrate the reduced seed-rates for kuruvai and samba nurseries. One thousand and seventy-two acres were thus planted spread over in 97 villages.

Green manuring.—The importance of growing green manure crops has been constantly brought home to the minds of the ryots and they realize the importance of green manure crops. The chief crops grown are Kolinji, daincha, indigo, sunnhemp and pillipesara. One lakh, twenty-five thousands and four pounds of green manure seeds were sold departmentally in addition to very large quantities sold by private merchants and corporate bodies. The area under green manure crop is estimated at 236,371 acres.

Judicious application of fertilizers and use of bonemeal with green manure is always advocated.

(b) Millets.

(1) *Cholam.*—Strain A.S. 2095 is the only strain getting popular though it fetches a lower price than the pure white cholam as its colour is dull. A.S. 389, A.S. 1575, A.S. 1543, A.S. 97 and A.S. 46 are being tried. A.S. 389 has proved better than the local in Trichinopoly district, and this may spread in the irrigated Sencholan area. Three thousand three hundred and sixteen pounds of seeds of different varieties were sold departmentally and which were sown in 466 acres.

(2) *Ragi.*—E.C. 593, E.C. 24 and E.C. 3735 are under spread. The longer duration of E.C. 593 than the local stands in the way of its extension. E.C. 24 in Tinnevely division and E.C. 3735 in Madura division have fared well. Short duration types of E.C. 3517, 3030 and 2985 are under trial.

Eight hundred and nineteen pounds of strains were distributed departmentally and the area covered is 1,928 acres.

(3) *Cumbu.*—P.T. 499 and 700 have given higher yields than local but the grain is not appreciated by the ryots as it is big in size and is secondly not having good flavour. P.T. 700 is popular in Madura district. KPT. 5, 8 and 105 are faring well in Tinnevely division. Nine hundred and eighteen pounds of seeds were distributed. Five thousand one hundred and sixty-eight acres were under these strains.

(c) Fibres.

Multiplication and distribution of improved strains of cambodia and karunganni cottons continued as in previous years. Co. 2 cambodia and K. 1 karunganni cotton are popular. X3915Q and X4383B are found quite suitable for Sankarankoil, Sattur and Srivilliputtur taluks. Trials of new strains, viz., Cambodia 920, 1267, 3915, 4383, 4463 and karunganni strains L. 3-4/4. N. 3-2/4, C. 6-4, 6142, 2919 and 4714 were conducted. Numbers 920 and 3915 are promising. Karunganni strains 6144 and 4714 are also promising. In South Arcot, Co. 2 cotton is becoming very popular in garden land areas. Forty-six thousand one hundred and forty-two pounds of Co. 2, 27,648 lb. of other strains of cambodia and 106,284 lb. of K. 1 seeds were sold departmentally. Seventy-three thousand three hundred and twenty-three acres of Co. 2, 4,136 acres of other strains of cambodia and 101,600 acres of K. 1 and 50,195 acres of other strains of karunganni were grown.

Seed farms.—The seed farm areas run under different strains are as follows:—

	ACS
Co. 2	419
X3915 Q	58
X4383 B	770
K. 1	927

Drill sowing.—Line sowing of cambodia cotton was done in 7,620 acres and karunganni was drill sown in 23,438 acres.

(d) Sugarcane.

Sugarcane is an important crop of this circle except in the Tinnevely division. Co. 281, Co. 419, POJ. 2878, Co. 352, Co. 417 and Fiji B are the popular canes of this circle. Fiji B is a popular chewing variety.

In the new delta area several varieties of canes such as Co. 419, POJ. 2878, Co. 421, Fiji B, Co. 313, Co. 285 are being tried.

In South Arcot district due to the sugar factory at Nellikuppam very large areas are grown under improved varieties, viz., Co. 281, Co. 419, Co. 349 and POJ. 2878.

The area under sugarcane is steadily increasing especially in South Arcot, Tanjore and Trichinopoly districts. The ryots are now able to obtain their requirements of seed material from the locally raised improved strains. Eighty-six thousand seven hundred and forty setts were distributed departmentally to the ryots and the total area under improved varieties is estimated at 18,978 acres. Other improvements effected are planting in trenches, proper spacing, judicious manuring and better method of preparing jaggery with improved furnaces. Three hundred and sixty-seven improved furnaces were constructed for jaggery preparation, 167 demonstrations were conducted in preparing better jaggery and 16 demonstrations were done on cream jaggery preparation.

Palmyra jaggery is made in large quantities in Tiruchendur and Tenkasi taluks of Tinnevely district. Demonstrations of improved jaggery making methods by de-liming the juice with super-phosphate and filtering through activated charcoal filters has just been taken.

(c) Oil-seeds.

(i) *Groundnut*.—A.H. 25, A.H. 45 and A.H. 32 are the varieties that are popular. Nineteen thousand two hundred and eighteen pounds of seeds were distributed and improved strains covered an area of 13,309 acres. Seed farms have been arranged to meet the demands of the ryots.

(ii) *Coconuts*.—Nine hundred and twenty-three seed nuts and 269 seedlings were supplied during the year from the Agricultural Research Stations, Kasargod and Nileshwar and there is a great demand for the same. Other improvements effected are proper spacing, intercultivation and growing of green manure crops in the topes.

(iii) *Gingelly*.—Trials were conducted with S.I. 89 and S.I. 88, S.I. 46 and S.I. 43. S.I. 89 gave better yield at Musiri than the local but it did not fare so well in Karur taluk. One hundred and twenty pounds of seeds were distributed. The above varieties were grown in about 27 acres.

(iv) *Castor*.—Four castor strains were tried in Trichinopoly district and fairly good yields were recorded. Twenty-one pounds of seeds were sold.

(f) Spices.

One hundred and thirty-three and a half pounds of Bellary onion seeds were distributed. This is becoming popular in places adjoining big towns.

(g) Drugs and narcotics.

As a result of the interest created to raise cigarette tobacco in Cuddalore taluk last year, it is now being cultivated in 15 acres by a mirasidar and two flue curing barns have been constructed

by him. The opinion that cigarette varieties cannot be grown in irrigable lands has to be revised as the crop came up well and good quality leaves were obtained. Half an ounce of seed of H.S. 9 (Harrison's Special) was supplied to the same ryot.

(h) Vegetables.

Attempts were made to improve vegetable cultivation in Kodaikanal Hills. The Great Scot variety of potatoes is popular in Kodaikanal area and 64 acres were under this crop. 12,549 lb. of seed potatoes were distributed departmentally. Nanjanad manure mixture (815 lb.) was distributed through the co-operative sale society to increase the yield of potatoes. Fourteen varieties of potatoes are being tried.

Vegetable seeds from reputed seedsmen are obtained and distributed. The area under these comes to about 32 acres in Kodaikanal area. Tomatoes have become popular in Trichinopoly, Madurai, Tanjore and South Arcot districts. About 22 lb. of vegetable seeds, 221 packets and 4,600 tomato seedlings were distributed departmentally.

(i) Fruits.

Necessary propaganda was made to grow more fruits in suitable places. Every encouragement was given to ryots to take up fruit cultivation on improved lines. Suitable grafts were obtained either from Fruit Research Station, Kodur, or from reputed nurserymen. Advice was given regarding the methods of planting, manuring, inter-cultivation, pruning and spraying the trees against pests and diseases.

10,060 fruit plants, viz., mango varieties, sathugudi, oranges, sapotas, pineapple, lime, grape-vine, etc., were distributed.

(j) Fodders.

The ryots were advised to grow green fodder for cattle. The Sewage Farm at Madurai, Palni Devasthanam, Sacred Heart's College, Kodaikanal, and the Railway Colony, Golden Rock, continued to grow guinea and Napier grasses. 5,255 lb. of cholam seeds, 44,175 slips of guinea and Napier grass, 5½ lb. of lucerne, 43 lb. of maize, 5,548 lb. of pillipesara and 120½ lb. of kolukattai grass were supplied to ryots departmentally.

There were 10 silage pits in this circle.

(3) Implements.

The following demonstrations were conducted:—

(a) Improved implements

(b) Other labour-saving appliances

3,592
1,959

The following sales were effected :—

Iron ploughs	1,110
Spare parts for ploughs	1,387
Guntakas	18
Seed drills	81
Mhote wheels	314
Chaff cutters	4
Cane mills	15
Junior hoes	11
Bund formers	18
Digging fork	33
Buck scraper	4
Cooper's Persian Wheel Waterlift	3
Turmeric polisher	1
Triangular harrow	1
Danthulu	50
Pitting crowbar	3
Trampler	8
Puddler	3
Madras Ridger	2
Sprayer	10
Secateur	1
Sugarcane power crusher	4
Circular mhote	2
Beehives	628
Smoker	1
Extractor	1

(4) Manures.

Intensive propaganda on the proper collection and preservation of cattle manure was continued. Though the ryots realize the importance of this they still neglect it in many cases.

The following manure pits, etc., were laid during the year under report :—

Manure pits	5,851
Dry earth sheds	1,508
Loose boxes	24
Byres	27
Heaps covered with tank silt	2,639
Compost pits	572
Habitation wastes	45
Trenches for collecting urine	30
Renovation of old pits	1,051

The Bangalore method of composting was done in Palni, Kodaikanal, Periyakulam, Ariyalur and Madura taluks. Making compost of all habitation wastes, cane trash, groundnut, husk, etc., was advocated. The Panchayat Board, Papanasam, and the municipalities of Tanjore and Mannargudi have just taken it up.

(5) Pests and Diseases.

Whenever reports were received about the occurrence of pests and diseases, the crops were inspected and suitable remedies suggested and demonstrated. Stem-borer on paddy, thrips on onions and chillies, borers on sugarcane, Epilachnas on brinjals, Rhinoceros beetle and Palm Weevil on coconuts, army worm of paddy, Red Hairy caterpillar on groundnut, Pink Boll worm and Stem-weevil on cotton, are some of the insect pests.

Panama disease on plantains, Dieback and Gummosis on citrus, stem-bleeding on coconuts, Mildew on grape-vines were the fungoid diseases noticed. The Mycology and Entomology Demonstrators and the Agricultural Demonstrators attended to the several calls and arranged for spraying and other remedial measures.

Four hundred sprayings and dustings were conducted.

(6) Pest Act.

Cotton Pest Act.—The Cotton Pest Act was in force in Madura and Trichinopoly districts. In Trichinopoly district it was completely eradicated before 1st September 1939 in Karur, Lalgudi and Perambalur taluks and before the end of September in Musiri and Trichinopoly taluks and by 23rd October 1939 in Kulittalai taluk where extension was granted for one month. In Madura district eradication was complete by the end of August in all taluks except Thirumangalam and Periyakulam. The Mallapuram area of Tirumangalam taluk was exempted by the Government for one year. Against 36 defaulters in Periyakulam taluk and one in Melur taluk, the Collector sanctioned prosecution proceedings.

Cotton Control Act.—Prohibiting the cultivation of Pulichai cotton was in force in Madura and Tinnevely districts. It has almost been eradicated in Madura district and only very stray plants were noticed in Tirumangalam taluk and these were removed in time.

In Tinnevely district a special Demonstrator was posted for detection work from 8th December 1939. Two hundred and forty cases have been fined by the Sub-Magistrates and a total fine of Rs. 1,213 was collected. Sixty-nine cases are still pending in Courts.

Groundnut Pest Act.—The Pest Act for the control of Red Hairy Caterpillar on groundnut and cumbu was in force in South Arcot district, Musiri and Udayarpalayam taluks of Trichinopoly district and in portions of Tanjore and Pattukkottai taluks of Tanjore district. Emergence of the moth was not severe and there was very little loss to the crops.

Water Hyacinth.—The Act against the water hyacinth was in force in Trichinopoly, South Arcot and Tanjore districts and steps were taken to eradicate the same and thus it was kept under control.

(7) *Trial Plots.*

One hundred and eight trial plots were arranged during the year for paddy, ragi, cumbu, cholam, cotton and gingelly.

(8) *Demonstration Plots.*

Two thousand two hundred and six demonstration plots of sugarcane, ragi, cholam, cumbu and groundnut were laid down in ryots' lands at their cost.

(9) *Joint work with other departments.*

The Department participated in the Health, Municipal and Agricultural Association Exhibitions, Ryots Conferences and helped the Co-operative Agricultural Societies in the demonstration of improved implements, production and distribution of seeds, etc. The Agricultural Demonstrators attended the meetings of the Taluk Rural Reconstruction Committees, Taluk Educational Advisory Committees and sometimes the War Prices Control Committees. The several loan and sale societies were helped to stock the agricultural produce, seeds and manures for sale. The paddy loan and sale society at Chidambaram advanced about two lakhs of rupees to paddy growers on the pledge of the produce to enable them to sell it when prices were at their best. The Revenue Department co-operated in enforcing the Pest Acts, and in the crop-cutting experiments in respect of paddy, ragi, cumbu, cholam and sugarcane. A few panchayat boards and municipalities co-operated in composting habitation wastes and municipal sweepings with nightsoil.

(10) *Agricultural Associations.*

There are two District Agricultural Associations at Tanjore and Trichinopoly. The Trichinopoly District Agricultural Association publishes a monthly journal, conducts meetings and exhibitions. In addition to the two associations mentioned above there are 58 of taluk and village agricultural associations. They were induced to take greater interest in agricultural improvements.

(11) *Exhibitions and Fairs.*

26 large and 69 small exhibitions were held during festivals, cattle fairs, health weeks, etc.

(12) *Lectures.*

16 lantern lectures and 504 ordinary lectures were delivered by the district staff during the year.

(13) *Motor Exhibition Van.*

The Agricultural Demonstrators of Cuddalore Division toured with the District Rural Reconstruction Vans and Veterinary Department Propaganda Van.

(14) *Loans.*

Rupees 7,071 were distributed to 691 loanees under Takavi loans for the purchase of ploughs, mhote wheels, sprayers, horse cultivators, bund-formers and chaff cutters.

(15) *Bee-keeping.*

This useful paying hobby and sideline to farming is getting popular. 2,351 colonies are now working in the circle. The Agricultural Demonstrators helped the parties in hiving colonies, extracting honey by the honey extractors and maintaining them properly. There was one special Bee-messenger in Tinnevely district for the whole year and another messenger in Trichinopoly district for four months.

(16) *Publications.*

Leaflets are freely issued to several ryots and others while villagers' calendars and priced bulletins and books were sold. The following sales were conducted:—

Villagers' Calendars	...	...	...	...	5,688
Books and bulletins	...	...	...	...	495

IV.—RESEARCH STATIONS.

A.—*Agricultural Research Station, Aduturai.*

1. *Charge.*—Sri M. Anandan was in charge till 31st August 1939 when the gazetted post of the Superintendent was retrenched and Sri T. K. Balaji Rao, Senior Science Assistant, assumed charge.

2. *Season.*—The season was not favourable for the first crop paddy while it was fair for the main and second crops. The steady supply of water from the Cauvery greatly aided the situation.

3. *Crops.*—(a) *Paddy.*—The 19 strains of paddy were grown for distribution. Yield tests of pure line selections from different varieties were carried out. District trials of Vadan samba, Molagolukulu and piricularia resistant strains were conducted.

Manurial trials on paddy and the study on duty of water were carried out as in last year. Trials on electro-culture were also undertaken. One lakh and sixteen thousand and nine hundred and fourteen pounds (116,914 lb.) of seeds were distributed.

(b) *Other crops*.—Five varieties of sugarcane planted in 77 cents gave an acre yield of 27.6 tons; the promising varieties being Co. 419, 421, 353 and 281. The twenty-one varieties which were ratooned in 1.05 acres yielded at the rate of 14.6 tons per acre. 83,290 setts were distributed.

Plantains and vegetables were also tried.

433,419 lb. of green manure crops were raised on the station.

27,850 slips of Napier grass and guinea grass, 507 lb. of pillipesara, 4,046 lb. of daincha and 174 lb. of *Sesbania speciosa* seeds were sold to applicants.

4. *Livestock*.—In addition to six pairs of work animals, a herd of four Scindhe cows and a Scindhe breeding bull, one Ongole bull and two Kangayam bulls at stud were maintained. One hundred and forty services were performed. The Ongole herd with two Ongole cows, one with a calf at foot, three heifers and one bull were transferred to Guntur. Three thousand five hundred and eighty-seven and a half (3,587½ lb.) of milk were received of which 3,339 lb. were sold to customers and the rest fed to calves and chicks.

5. *Poultry*.—There were 115 birds at the end of the year. 7,038 eggs were gathered during the year.

6. *Apiculture*.—Six colonies were working at the end of the year. Due to severe summer and absence of forage plants, only 3 lb. 2 oz. of honey were extracted and sold.

7. *Pisciculture*.—98 lb. 14 oz. of different kinds of fish were caught from the old fish-pond and sold.

The new fish-pond was stocked with fingerlings of Gourami.

8. *Petty construction and repairs*.—The annual repairs to office buildings were carried out.

B.—Agricultural Research Station, Kovilpatti.

1. *Season*.—25.07 inches of rain was recorded. Being below the normal and ill-distributed, the rainfall was responsible for failure of pulse crop and low yields of cotton and cereal crops. The hot weather rains were helpful for a summer picking in cotton.

2. *Crops*—(i) *Cotton*.—The crop occupied 50.59 acres. The average yield of kapas for the main season was 242 lb. being the lowest for the past 31 years. The summer pickings will increase the yield a little.

(ii) *Cholam*.—28.61 acres were under irungu cholam for fodder. Selection No. 14 of the station gave 4,819 lb. of straw per acre. This is the highest yield for the station for the year.

(iii) *Cumbu*.—About 22 acres were under this crop. The crop gave an acre yield of 396 lb. of grain.

(iv) *Miscellaneous crops*—(a) *Groundnut*.—A.H. 45 and local bunch varieties were on trial and these gave 128 lb. and 250 lb. of pods, respectively per acre. The yields in general were poor because of an attack of Surul poochi.

(b) *Tobacco*.—Local and Harrison Special No. 8 gave 2,160 lb. and 1,989 lb. of cured leaf per acre, respectively.

(c) *Blackgram, greengram and coriander*.—These failed to give any appreciable yield on account of adverse seasonal conditions.

(d) *Minor millets* such as *tennai, varagu, ragi and kudiravali* were tried and their yields were 285 lb., 400 lb., 393 lb. and 1,010 lb. per acre, respectively.

(e) *Tomatoes, Knolkhol and Bellary onions* have given 2,788 lb., 10,663 lb. and 8,850 lb. per acre, respectively.

(f) *Maize and Periamanjol cholam* gave an acre yield of 17,400 lb. and 23,912 lb. of green stuff, respectively.

Lucerne (December to June) gave an acre yield of 25,432 lb. of green stuff and *Berscem* (December to March) gave 5,712 lb. of green stuff per acre.

3. (a) *Livestock*.—There were 24 heads of animals at the beginning of the year. Four calves were born, four old animals were sold in auction, one cow died and one Kangayam breeding bull was castrated for use as work animal. The year closed with three breeding bulls, eight work animals, three cows, five bull calves, four heifer calves—23 heads of animals in all. The breeding bulls did 150 services in all. 3,791 lb. of milk were sold from the station.

(b) *Poultry*.—Fifty-nine birds were on stock. During the year 21 birds died and the remaining 38 birds were sold in auction, as the flock was badly mixed up. 267 eggs were received of which 236 eggs were sold and the rest were fed to chicks.

4. *Ginnery*.—56,377 lb. of seed farm kapas and 10,248½ lb. of station kapas were ginned.

5. *Silage*.—23,588 lb. of Periamanjol cholam green stalks were converted into silage and this silage is being fed to cattle.

6. *Seed distribution*.—12,450 lb. of cotton seeds, 6,606 lb. of cholam seeds, 1,021 lb. of cumbu seeds, 918 lb. of groundnut seed pods, 408 lb. of ragi seeds, 250 lb. of maize seeds and 800 slips of guinea grass were distributed.

7. *Petty construction and repairs*.—Only ordinary repairs to residential and non-residential buildings were done at a cost of Rs. 64-8-0 and Rs. 50, respectively.

C.—Rice Research Station, Ambasamudram.

1. *Season*.—The total rainfall of 20.72 inches was very defective. The South-West monsoon was quite favourable for the kar crop. But the North-East monsoon was a failure and as such the second crop was adversely affected.

2. *Crops—Paddy*.—Eight hundred and seventy-six seed-beds in kar selections and eight hundred and eighty-seven seed-beds in pishanam selections were sown. 7.86 acres were devoted to inter-varietal trials, pureline culture studies and seed-multiplication. The nursery area of 1.63 acres was planted with Co. 2 and manawari varieties. Co. 2 gave an acre yield of 4,427 lb.

Ten thousand and nine hundred pounds of paddy seed will be available for distribution in the coming season.

3. *Green manure crops*.—Green manure crops were grown in all the fields except the nursery area. The average acre yield of green stuff from a crop of daincha (grown in 4.92 acres) was 10,056 lb.

4. *Miscellaneous*.—A few vegetable varieties were tried in eight cents in the dry land block but were not successful due to hard gravelly nature of the sub-soil.

5. *Pests and diseases*.—The borer and mealey bugs on paddy made their appearance but they were kept under control by light traps and by prompt removal of the affected plants. The rodent trouble was kept under check by rat-traps and hand-catching.

6. *Livestock*.—The two pairs of work animals at the station maintained good health.

7. *Visitors*.—Besides the officials a number of prominent mirasudars visited the station.

8. *Petty construction and repairs*.—The repairs to the threshing floor and putting wind-ties to the cattle-shed were executed.

D.—Agricultural Research Station, Pattukkottai.

1. *Season*.—There was a rainfall of 57.49 inches as against 38.67 inches of last year. There were long spells of drought from the middle of August to the end of September and again from the end of November. The wet weather that set in during the last days of September terminated with a cyclone and the unprecedented floods in November. Owing to the breaches in the Grand Anicut Canal there was no water-supply for about a fortnight in December which affected adversely all standing crops. The season was on the whole unfavourable for dry and garden crops.

2. (a) *Dry land area*.—Four acres were cropped with groundnut and the acre yields averaged to only 689 lb. In the Imperial Council of Agricultural Research trials A.H. 477 proved to be the best among the seven varieties tried.

Horsegram could be grown only in 2 acres for green manure and 1,255 lb. of stuff per acre were ploughed under.

(b) *Garden land area*.—Ragi, maize, groundnut, cotton, onion and tobacco were tried. Among the vegetables brinjal fared well with an acre yield of 5,761 lb. Among the fodder crops *Ipomea hispida* grown during the summer gave an acre yield of 8,000 lb. which indicates its potentialities for this tract.

(c) *Wet land area*.—Single-crop samba (Add. 10) has given a net profit of Rs. 58-10-0 per acre and turmeric in double-crop area Rs. 96 per acre, while sugarcane has given only a profit of Rs. 44-8-0 per acre.

None of the Coimbatore strains under trial proved as suitable to the tract as Add. 10 for samba and Add. 11 for thaladi. In green leaf, bonemeal and liming experiments, the results were not significant.

From the experiments conducted to find out whether two crops of paddy or groundnut followed by paddy would be more profitable, the indications are in favour of the former.

3. *Green manures*.—Kolinji and daincha sown in 15 acres fared well and the crops were ploughed under to improve the soil fertility.

All available waste materials, especially cane trash, were composted to enhance the supply of manure.

4. *Livestock*.—Of the five pairs of animals maintained one animal died during the year and an old pair was auctioned off. Kangayam breeding bull No. 200 was castrated and a new pair of Hallikar bullocks was obtained from the Livestock Research Station, Hosur, and the strength was thus made up to the original.

5. *Seed distribution*.—Thirty-four thousand two hundred and thirty-eight pounds (34,238 lb.) of paddy seeds, 51 lb. of ragi seeds, 2,951 lb. of groundnut seed pods, 12,500 cane setts, 600 tapioca cuttings, 12,000 guinea grass slips and 284 plantain suckers were distributed.

E.—Agricultural Research Station, Palur.

1. *Season*.—A rainfall of 50.62 inches was received as against 44.29 inches of last year, the average for the last 36 years being 50.58 inches. The hot weather rains were well above the average and the South-West monsoon rains were insufficient. More than 50 per cent of the North-East monsoon rains were recorded in the first three weeks of November with no showers later on. The season, on the whole was not very favourable for the main crops on the farm due to uneven distribution of rains.

2. *Crops*.—(i) *Paddy*.—This crop occupies 14.83 acres of which 9.03 acres were under green manure crops of daincha and pillipesara. The average acre yield of paddy was 3,174 lb. as against 3,235 lb. of the previous year.

(ii) The first-crop paddy varieties gave less than normal yields due to insufficient rains during the south-west monsoon. The average acre yield was 2,852 lb. as against 2,992 lb. of last year. The main samba crop fared better giving an average acre yield of 3,953 lb. as against 3,919 lb. of the previous year. The bulk crop of Palur No. 1 grown in 2 acres gave an average acre yield of 4,825 lb., a record yield of the station. The second-crop paddies fared satisfactorily and yielded 2,725 lb. per acre as against 2,508 lb. of the previous year.

(iii) Bulk trials of the application of 40 lb. of ammonium sulphate as top dressing has generally resulted in increased yields over the control. A regular experiment will be started in the next season.

(iv) Selection work on sornawari and samba varieties of the tract are in progress. Five series of strip trials in the first-crop paddy varieties and nine in samba varieties were conducted during the year.

(v) *Sugarcane*.—The crop was raised in 10.30 acres as against 9.40 acres of last year. The average acre yield was 34.45 tons as against 40.71 tons of last year. The reduction in yield is due to a third of the area being under no manure and half the usual dose of the manure in the manurial experiments. Thirty-one cane varieties were under detailed study and six varieties were under comparative trials of which Co. 421 and Co. 413 are promising varieties giving good tonnage with better purity. Co. 419 as usual gives the best tonnage closely followed by Co. 349 and P.O.J. 2878, Co. 270 and 313 are two early ripeners like Co. 281. Co. 363 is found to be a suitable variety for late crushing in May. Two experiments—one varietal cum manurial experiment with three varieties and three levels of nitrogen, phosphoric acid and potash and another to find out the effect of organic and inorganic and a combination of both manures on the yield of cane—were started for the first time. Higher doses of nitrogen give higher yields, phosphoric acid and potash have no effect on yield or purity.

Other crops.—Cumbu gave an acre yield of 862 lb., varagu gave 1,047 lb. per acre. Ragi planted in June 1939 gave only 769 lb. while that planted in January 1940 gave 1,273 lb. per acre.

7.17 acres were under groundnut of which 3.67 acres were inter-sown with ragi. Due to unfavourable season and damage by *Surul puchi*, the yield was only 1,803 lb. per acre as against 3,604 lb. of last year.

Cotton strain Nos. 3915 and 4383-B were under strip trials both in garden and wet lands with Coimbatore No. 2 as control. Both are early strains giving better yields than Co. 2 and are eminently suited for the tract as sowing is generally done in December or January in garden lands and February or March in wet lands.

Fodders.—Under rain-fed conditions cholam tops the list giving 37,689 lb. per acre, teosinte gave 30,370 lb. while cumbu and maize gave only 14,125 lb. and 9,869 lb. per acre respectively. Kaki jonna 502 and 26/152 have given an average yield of 25,000 lb. per acre. Berseem was tried both in June and December; the former was a failure and the latter gave 20,000 lb. per acre indicating once again that December is the best time for growing the crop.

Fruit trees.—Six Sathugudis and one Batavian orange have come to bearing this year as well as five graft mangoes.

Flowers.—Eighty-five rose plants raised in 6½ cents gave Rs. 60 worth of flowers even when sold at very cheap rates.

Sideline of farming—(i) *Poultry*.—The flock at the beginning consisted of 175 birds including chicks. The balance at the end of the year including chicks hatched out was 91, after sales of 94 birds for breeding and 67 chicks for table. There was a net profit of Rs. 97-10-7 on a capital outlay of Rs. 820.

(ii) *Cattle*.—An average of 7.29 pairs of working animals were maintained. One animal died of tumour in the eye. Two bulls were maintained at stud and the demand for service is on the increase. Kangayam No. 106 is becoming useless for service and has to be replaced.

Exhibitions.—Several kinds of exhibits were sent to six exhibitions held in the circle and outside.

Practical training.—Eight ordinary coolies were given training in all farm operations including jaggery making and poultry-keeping. Three of them belonged to scheduled classes and one was a Muhammadan.

Seed distribution.—34,588 lb. of paddy seeds, 3,722 lb. of groundnut seed pods, 275 lb. of ragi, 216 lb. of gingelly, 234 lb. of cholam, 300 lb. of pillipesara, 180 lb. of daincha, 71,600 setts of sugarcane varieties and 21,950 grass slips were distributed.

Visitors.—There were 524 visitors at the station.

Buildings.—A sum of Rs. 164-14-7 was spent on ordinary repairs and white washing to the non-residential buildings.

TRICHINOPOLY,
31st July 1940.

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

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR
OF AGRICULTURE, IV CIRCLE, COIMBATORE, FOR
THE YEAR 1939-40 (FROM 1st JULY 1939 TO 30th
JUNE 1940).

I.—CHARGE.

Sri C. Ramaswami Nayudu was in charge of the Fourth Circle from 1st July 1939 to 12th November 1939. On my return from leave, I took charge from him on 13th November 1939 and continued to be in charge of the circle for the remaining part of the year.

2. Sri M. U. Vellodi was in charge of Tellicherry division throughout the year except from 1st November 1939 to 21st December 1939 when he went on leave and the Deputy Director of Agriculture held additional charge of the division.

3. Sri K. Avudainayakam Pillai was in charge of the Coimbatore division.

4. Sri V. T. Subbiah Mudaliyar was in charge of Tiruppattur division from 1st July 1939 to 20th December 1939 when he was relieved by Sri A. Ramaswami Ayyar, who continued to be in charge for the rest of the year.

5. The control of the Agricultural Research Station, Nanjanad, was transferred to the Curator, Government Botanic Gardens and Parks, Ootacamund, from 1st May 1940.

6. The Agricultural Research Station, Taliparamba, continued to be in charge of a Farm Manager under the direct control of the Assistant Director of Agriculture, Tellicherry, throughout the year.

7. There were 21 Agricultural Demonstrators and one Entomology Assistant in Tiruppattur division. In Coimbatore division, there were 14 Agricultural Demonstrators including the Agricultural Demonstrator, Gudalur, where a sub-circle was opened from 16th October 1939. One Agricultural Demonstrator, P. P. Syed Muhammad, was deputed to work under the Secretary, Tiruppur Co-operative Sale Society, from 1st March 1940. In Tellicherry division, there were 15 Agricultural Demonstrators and one Assistant Agricultural Demonstrator, Mycology.

The Assistant in Entomology and the Assistant Agricultural Demonstrator in Mycology had their training in Mycology and Entomology respectively. The Sub-Assistant in Mycology, assisted by three demonstration maistries, continued to be in charge of Palm Bud-rot campaign.

II.—DEMONSTRATION.

(1) *Season and Rainfall.*

The season has been on the whole one of good rainfall, but the distribution was not very favourable. June and July were rainy months throughout the circle and cultivators commenced operations

with great hope. There was an unusually long dry spell in August and September which depressed the crops and upset further programme. The North-East monsoon commenced in right time and facilitated the sowing and growth of late crops. The rains held back after November and most of the crops gave only a depressed yield. Many wells and tanks that remained partly or completely dry for the past two years in Coimbatore, Salem and North Arcot districts received their supply and irrigated crops could be grown without much difficulty. The famine conditions that prevailed in Coimbatore district disappeared completely. The plantation crops like coconuts or pepper did not suffer. On the Nilgiris, however, the season was generally more favourable except for the very brief short-comings of the South-West monsoon, and the dry months from December to March. Heavy summer rains caused water-logging in fields.

The hot weather rains of April and May were timely and fairly heavy. They facilitated the sowing and growth of crops in general. The prospects for the future year are so far evidently bright.

(2) *Crops.*

(a) *Cereals.*

(1) *Paddy.*—The season has been generally good for paddy cultivation and the area under paddy was on the increase under the well irrigated crops.

Including Ptb. 11, a strain of Halliga variety of South Kanara, newly released, 66 varieties of paddy were distributed during the year. The sales amounted to 169,070 lb. The distribution would have been much more but for the shortage of supply. Work, started from 1937 to encourage private organizations to multiply and distribute seeds, is progressing satisfactorily. Two co-operative societies, Trithala and Vadavanur of the Malabar district, did signal work by producing and distributing 7,050 lb. and 1,200 lb. respectively. Three other co-operative societies in Walluvanad taluk of Malabar district specially selected and helped by the staff produced and distributed 25,000 lb. of improved strains of local varieties in the taluk itself. Two societies in Mangalore taluk have been given seeds to commence seed multiplication work. The scheme of seed multiplication work has been just started similarly in Attur and Vellore taluks of Salem and North Arcot districts respectively. The total quantity distributed directly should cover 7,025 acres and the natural spread is estimated to be 148,234 acres in the circle. Thus it may be stated that of the total area under paddy about 7 per cent is under new strains.

In commenting on the strains, mention has to be made of G.E.B. 24, which is growing in popularity on account of its cosmopolitan character and shorter duration. The higher yields of very

fine grain it produces has the additional advantage of a slightly higher price in any market. Co. 2 is a strain next in importance. It is useful to go in as a late crop when other varieties have lost their season and is fit for most places. It also gives a fair yield of fine paddy. The two strains cover major portion of the area under improved strains in the circle. Co. 3 is a strain of Coimbatore Vellai samba that has grown popular in Salem, Malabar and South Kanara districts. The last district seems to require fresh seed every year. Efforts are being made to successfully collect and preserve seeds from the local crops. All the Pattambi strains are getting popular in the West Coast. Adt. 3 and 4 and a strain of Vadan samba are getting popular as kar varieties. The last one is spreading in the semi-dry paddy areas of North Arcot district.

The growing of thin nursery and economic planting go hand in hand with new strains. Considerable advance has been made this way in reducing the waste of seed. The area under economic planting may be estimated to be 88,135 acres in this circle.

(2) *Cholam*.—The season has been favourable for cholam generally but for the depression caused on the rainfed crop by the shortage of rains. About 17 strains evolved by the Millets Specialist were distributed. A.S. 809, 1575, 1543 and 2095 are so far found to be popular as irrigated grain crop in Coimbatore. A.S. 29 and 1098 are found to be better than the Periamanjil cholam in Coimbatore district as a rainfed crop. A.S. 1355, a sweet-stalked variety, is preferred as a fodder crop by ryots. In Salem district Periamanjil cholam has become a popular fodder crop. It sets seeds in most places. None of the strains are found doing very well so far in North Arcot and Salem districts. It may be necessary to evolve strains from local varieties of cholam to attain success. However A.S. 1055, 1093 and 4283 strains from Thalaivirichan cholam rainfed crop are under trial in North Arcot district, where some ryots are found inclined to grow Thalaivirichan. The quantity of seeds distributed during the year amounts to 14,222 lb. It is expected to cover over 1,000 acres. Including natural spread, the area under new strains is estimated to be 4,605 acres.

(3) *Ragi*.—The season has been favourable to the crop. E.C. 593 ragi is the most popular strain and is found to give from 10 to 15 per cent higher yield. It is of a longer duration and consequently requires two waterings more than the local variety. Thus its popularity is confined to areas and seasons of good water-supply. Its popularity as a dry crop is greater since growing of dry ragi depends upon plentiful rainfall. Strain Nos. E.C. 3735 and 3517 are confined to very small areas owing to the limitation of water-supply. H. 22 ragi as a rainfed crop is getting popular in Gudalur taluk of Nilgiris district and in the northern taluks of Salem district. The total quantity of seeds of improved strains distributed is 8,004 lb. It is expected that the new strains cover an area of 15,249 acres including natural spread.

(4) *Cumbu*.—The rainfed crop suffered considerably on account of seasonal defects while the irrigated crop gave fairly good yields. P.T. 700 and P.T. 2229 were the two strains distributed. They are found to give superior grain and a slightly higher yield in the first instance. Mixtures and crosses soon set in limiting the natural spread to the second generation only. The quantity of seeds distributed is 1,809 lb. The area under the new strains including natural spread is nearly 1,606 acres.

(5) *Tenai*.—The season was not very favourable to the crop by the short rainfall in August-September. It is a minor crop often grown mixed with rainfed cotton though a few plots of the irrigated crop is seen in garden lands. 150 lb. of S.I. 523 and 554 Tenai, the only two strains evolved, were distributed. Including the natural spread, the area of improved strain was confined to 51 acres.

(6) *Bengalgram*.—The area under the crop is getting reduced due to shortage of cold weather rains; even this year the absence of rains after November reduced the yield of the crop. 2,000 lb. of strain No. 482 were distributed during the year. Including natural spread, the area under the strain is estimated to be 200 acres. It is a crop mostly confined to Coimbatore district.

(7) *Wheat*.—The area under wheat in the plains of Coimbatore district is declining owing to the inadequacy of water-supply in wells and the infection of rust. P. 4, P. 12, P. 52, P. 80-5, the Pusa types of wheat, are gradually becoming popular in the Nilgiris, and strain Nos. A. 013, A. 115 and H. 116 of Central Provinces and Federation, Ford and Bena of North-West Frontier Province wheats were tried on the hills. It was found that A. 013 strain was highly susceptible to rust and H. 116 was a very early crop which failed to set grains properly. A. 115 was, however, of the same duration as local wheat and did not show rust infection. Among the North-West Frontier varieties, the Federation wheat, which is the shortest in duration, leads. The total quantity of seeds distributed is 49 lb. The total area under improved strains comes to 38 acres.

(8) *Barley*.—This is confined to the hills. The season was fairly favourable. Trials were made with the more valuable Punjab brewing barley against local barley, the local variety being not quite suited for brewing purposes. The growth of the crops indicates that the Punjab variety is highly susceptible to both yellow and brown rust. However, further trials should be conducted before a definite statement can be made.

(b) *Fibres*.

Cambodia cotton.—The crop did not have a very favourable season as the heavy rains of October-November caused water stagnation in fields and a few of them in North Arcot and Salem districts had to be ploughed in and sown to other crops. The crop

that remained became generally stunted by the stagnation. The shortage of rains later than November depressed the progress of the rainfed crop and its outturn. It may be said that the whole of the Cambodia crop of the Coimbatore district is now grown with one or the other of the departmental strains; while in Salem district, the spread of strains is fast progressing. This has been possible by the seed multiplication work started by Government now handed over to the co-operative society at Tiruppur as it serves as the central seed distributing agency for the whole circle and part of other circles. A scheme to extend the seed multiplication work to Salem has been initiated by distributing 10,017 lb. of pure Co. 2 strain seed. The kapas were picked and ginned under departmental supervision. 74,652 lb. of good seed has been obtained and kept for future distribution.

In Tiruppur inner area seed farm run by the department to supply pure seeds particularly for the outer area worked by the co-operative organization covered an area of 829.67 acres yielding a total quantity of 234,682 lb. good seed kept for distribution. The seed farm lint of the year was sold at a premium of Rs. 15 to Rs. 23-8-0 per candy of 784 lb. over and above the best Tirupur Cambodia in the market. The supply of seed last year from inner area went down as low as 88,780 lb. due to seasonal defects. Therefore 73,794 lb.* of seed had to be purchased from the co-operative society to meet the demand. 92.95 acres were under Co. 920 strain seed farm in Coimbatore taluk. It yielded 32,694 lb. of seed. This strain is becoming more popular than Co. 2 in Coimbatore taluk, as it is giving over 5 per cent higher yield. The total amount of seeds of all Cambodia strains distributed during the year comes to 182,074 lb. including seed farms. With the natural spread, the area covered by Cambodia new strains is estimated to be 169,459 acres. Line sowing of Cambodia and use of cattle power for intercultivation is introduced in many places.

Uganda cross No. 4463 is finding favour with the ryots of Coimbatore taluk as the mills in Coimbatore encourage its spread.

Karunganni.—The season has been one of heavy rain soon after sowing. Want of rain after November affected the flushing and bolting of the crop. The ryots are of opinion that seasonal wind was not also favourable for the bursting of the bolls properly. Drill sowing with the use of mechanical seed drill was advocated and 220 acres were drilled across the slope of the fields as a demonstration. In 110 acres of the drilled area bunding about 10 feet apart either way was also done to prevent surface wash. When compared to a similar area of unbunded and broadcasted field, the drilled and banded area gave an average higher yield of about one-fourth pothi of kapas per acre costing Rs. 8. The additional expenditure in bunding came to only 3 annas per acre. The total bazaar seed is now getting unpopular as the departmental

* 31,360 lb. shown in last year's report. 42,434 lb. shown in this year's report.

strains C-7, K-1, KPT-1, gave higher yield. 27,386 lb. seeds were distributed this year. The area covered by the selected strains including natural spread is found to be 51,614 acres.

Seed farm work in Karunganni cotton was undertaken this year also in Udamalpet taluk. 9,375 lb. of seed was sown over an area of 777.64 acres of ryots land under seed farm condition. The cleaning and ginning of kapas is not yet complete. Owing to the poor season last year, the supply of seed farm seed was as poor as 6,615 lb. This necessitated the import of fresh seed from Sattur. The existing prejudice against locally-produced Karunganni seeds is being removed gradually.

(c) Fodders.

In Coimbatore and parts of Salem districts, the practice of growing cholam crop for fodder purposes is in vogue in most of the garden lands. The practice is being advocated in the other parts of Salem and in North Arcot. Periamanjil cholam seeds are in demand for the purpose, 2,090 lb. of seeds of this variety, was distributed besides 145 lb. of T.1 Jonna. Maize was tried as a fodder crop and 387 lb. of seed were distributed in Coimbatore district. 1,103 lb. of Kolukattai grass were procured and supplied to ryots besides 203 lb. of Lucerne seed mostly in Coimbatore district. 18,400 slips of Guinea grass, 2,100 slips of Napier grass and 1,250 slips of Kikuyu grass were also distributed as a result of propaganda for increasing the area under fodders. Fodder crops other than Guinea and Napier grasses were absent in the West Coast.

(d) Fruits.

As a result of intensive propaganda and a growing desire among the educated classes to introduce fruits in their dietary, there has been a greater demand for fruit plants and seeds. The nursery work at the Agricultural Research Station, Taliparamba, was started in good time. The demand was so large that the supply of plants at Government stations could not meet it. Therefore large number of plants had to be secured for the ryots from reliable private nurserymen. 31,149 plants of graft mangoes, oranges, sapotas, grape-vines and other miscellaneous plants were supplied to ryots including 16,795 pine-apple suckers. A scheme for encouraging fruit cultivation in Kolli hills of Salem district is under way as sanctioned by Government. As the first step of it, two Malayalees from the hill-tribe have been sent to the Agricultural Research Station, Koduru, for undergoing training.

(e) Vegetables.

Root crops.

(1) **Potatoes.**—Except for a few cases of fruit rot brought about by water stagnation of the irrigated crop at the late stages, the season has been quite favourable to the cultivation of potatoes. It is largely cultivated in the Nilgiris district. However in the

Gudalur taluk of it, the crop has introduced with fair amount of success this year. The introduction of the crop has also been attempted with success in the Shevaroy Hills and the Hosur taluk of Salem district. Great Scot variety has practically replaced the local varieties. Seed farm work was in progress to multiply and distribute seed tubers. 33 acres of seed farm gave 82,500 lb. of seeds for distribution. The whole quantity was sold away besides what was secured from the Agricultural Research Station, Nanjanad, and could be arranged locally. The total quantity of seed tubers distributed comes to 172,769 lb. Contour planting and proper manuring of the crop are advocated. The departmental help is given to ryots for grading the produce for seeds and the market.

(2) *Tapioca* cultivation has been spreading especially in West Coast with the new variety tried and introduced through Taliparamba Agricultural Research Station. Butter stick variety is very much in favour by the ryots. About 15,000 cuttings were distributed.

(3) *Bellary onion* cultivation was advocated as it gives a slightly higher yield than the local onions but surely higher price as it is in demand from the richer section of the people. Bellary variety onion is the only kind grown in South Kanara district. 475 lb. of seed were distributed in the circle.

Encouragement was given to the expansion of the cultivation of local vegetables and English vegetables. Tomato cultivation is specially on the increase, as the propaganda gets the support of the food specialists. 750 seedlings were distributed.

(f) Spices, condiments and narcotics.

(1) *Chillies* form another important dry crop of the West Coast where extensive cultivation of the crop on a field scale is copied by ryots especially in the neighbourhood of Taliparamba. The area under chillies in this tract alone has increased from 10 acres to 500 acres within the last five years. 90 lb. of chilli seeds were distributed during the year.

(2) *Ginger*.—Apart from its use as a vegetable, ginger cultivation on a field scale is very important in the West Coast, as the prepared dry ginger of commerce produced, there is in demand in foreign countries. The season was not very favourable for the crop, consequently the yield was low. The dull market further discouraged the cultivation and the area under ginger is getting reduced.

(3) *Pepper* is a crop exclusively of the West Coast. The season has been quite favourable. 3,100 cuttings from selected vines of pepper were distributed. The market remained very dull during the year.

(4) *Tobacco*.—Tobacco cultivation of the South Kanara district received special attention this year also owing to the fact that the

ryots generally adulterate the produce with sand. Considerable amount of propaganda was made to avoid the adulteration. Owing to the failure of the merchants to offer higher rates for the purer stuff propaganda was not of much avail. Samples of adulterated tobacco are being analysed by the Government Agricultural Chemist to fix the percentage of involuntary admixture of sand in a trade sample with a view to penalise wilful adulteration.

(5) *Pyrethrum* cultivation.—This crop was tried in selected areas in Coonoor and Yercaud. It was found thriving fairly well in the leased area at Kotagiri while at Yercaud it did not do so well. Every encouragement was given to its spread by supplying applicants with seeds, plants and advice. From the leased area all the well-grown plants were sold to applicants. Further demonstration was found unnecessary as planters have taken to its cultivation.

(g) Sugarcane.

The season has been on the whole favourable to sugarcane cultivation and the jaggery prices were ruling high in the early part of the year. There has been a sudden drop in jaggery prices which may affect the rate of expansion hereafter. The slump can be attributed to the lower demand for jaggery from Northern India, the higher yield of over 50 per cent that the improved varieties are giving and comparatively larger area that has been devoted to the crop by the ryots encouraged by the high ruling prices at the planting season. The local canes in all tracts are being replaced by the high yielding Coimbatore varieties. Co. 419 is the most popular variety throughout. Co. 421 and 413 come next. Co. 408 is also gaining favour with the West Coast ryots. The thin drought-resistant cane Co. 213, which had made quite a good headway already, is being abandoned, as it is very susceptible to Smut disease. Co. 432 said to withstand floods better than others is being multiplied at Taliparamba for trial in the flooding cane areas of South Kanara. The use of labour saving implements for forming trenches for cane planting and their intercultivation with bullock power is advocated with unremitting vigour. It is spreading to some extent. 6,014,597 sugarcane setts of the Coimbatore strains have been distributed to ryots in the whole circle, the seed multiplication being mostly done in the ryots' fields adopting even short cropping where the demand for setts was on the increase. The area under improved varieties including natural spread comes to 12,346 acres in this circle.

(h) Oil-seeds.

The major portion of the groundnut crop is cultivated as a rain-fed crop. The unfavourable distribution of rain affected the proper development of the crop and its yield. The market for the crop being dull due to want of export trade owing to war conditions, the cultivators are faced with a critical situation to market the produce. However even at the low prices, the crop giving a better income than many other crops encourages the ryot to expand the

area; even irrigated groundnut crops are coming into prominence in garden areas and wet lands.

A.H. 25 strain of the spreading variety and A.H. 45 of the bunch type are generally giving higher yields than the locals of the similar kinds. Although A.H. 25 has a reputation for higher yield the shelling percentage being lower the merchants offer lower prices for it when sold in bulk as unshelled nuts. The higher yield however more than compensates this defect and its spread in spite of the low prices is the result of propaganda, 10,099 lb. of seeds of the new strains have been distributed. The new strains are expected to cover 1,326 acres including the natural spread. Even on the hill slopes of the West Coast, the groundnut cultivation has been introduced with success and is likely to spread further.

Coconut.—There is considerable demand for the seeds of the Kasaragod seed nuts obtained from selected trees. The demand is too large to be met owing to the limitations of the supply being restricted to a few trees of the station. To handle the situation to the satisfaction of the ryots, arrangements are being made to pick out good mother trees in different places from where demand for seed nuts is arising. 1,427 seed nuts and 485 seedlings were distributed during the year.

Castor.—Castor strains obtained from Oil Seed Specialist were sown under observation and trial plots all over the circle. The results have not been so far very encouraging. Further trials will be conducted before definite opinion is given. 182 lb. of the new types of seeds have been distributed.

3. Implements.

Demonstrations were conducted on a large scale with ploughs and other implements approved by the Research Engineer. The ryots, who have carefully used the new implements like improved ploughs, junior hoe, buckscraper, bund-former, ridge plough, mechanical seed drill, turmeric polisher, roll-easy mhote wheel, etc., appreciated them very much. Even comparatively poor ryots were also able to purchase them with the help of takkavi loans. 6,530 demonstrations were conducted with the various implements. The light iron ploughs of Cooper No. 11, Cooper No. 25 and the heavier ones like Kirlosker No. 14 and Cooper No. 26, are gaining favour with the ryots. The complaint against them by the regular users is the high price of the spare parts. When the village blacksmith becomes fit to replace the easily worn out parts, their popularity will increase. A trial made with the turmeric polisher was found satisfactory and the Agricultural Demonstrator, Sri T. K. Thangavelu, who designed it, won a silver medal awarded by the Imperial Council of Agricultural Research. As a result of the demonstrations, 732 ploughs, 24 cane-mills, 5 fodder-cutters, 4 hoes and cultivators, 685 other implements and 1,778 spare parts were sold to the ryots in the circle.

4. Manure.

Propaganda with regard to the adoption by ryots of improvements in the method of collection and conservation of natural manures with a view to prevent the loss of waste materials of both the farm and household has occupied no small part of the work of the district staff. The great importance of this part of the work cannot be emphasized as cheap manure in plenty is the prime factor in profitable crop production. The expansion of the work is indicated by the following figures:—Farm yard manure pits—2,702; manure heaps covered with earth—2,867; conservation of cattle manure and urine—592; dry earth system—609; municipal rubbish composting including two night-soil composts of Bangalore process—187; compost pits of waste organic materials—301; litter bed for cattle—276.

Municipal rubbish has been successfully composted with night-soil in Dharapuram Municipality. The work of this kind has been started in Gobichettipalaiyam Panchayat Board. It is expected that the work will soon expand as the demonstrations must certainly go to increase their income.

Raising of green manure crops has been very successful both in wet and garden lands. It has been this year extended to manure 40 acres of dry lands of the West Coast where groundnut, hill paddy and sweet potatoes have been grown. The ryots have generally come to appreciate the system and the area is expanding gradually. Limitation imposed on the expansion by the supply of seed coming from outside is being slowly mitigated by attempts to produce such seeds locally. In fact, Sunnhemp seeds are being now produced in large quantities in Coimbatore and Salem districts. Daincha seeds are found available for sale with ryots in Attur taluk, Salem district. A large number of ryots are now attempting to collect Kolingi seeds locally. 54,066 lb. of green manure seeds were distributed during the year. The area under green manure crops of all kinds are estimated to be 21,745 acres.

Fertilizers.—Judicious use of oil cakes and fertilizers in conjunction with bulky organic manure was advocated. In the Nilgiris for potatoes, the departmental manure mixture has become more popular than patent mixtures placed in the market by manure firms. The sales of oil cakes amounted to 9,715 cwt. and 80,362 cwt. of other chemical manures were also sold.

5. Pests and Diseases.

There was no wide spread attack of any pests or diseases. The usual help was rendered to ryots in all reported cases to adopt control measures. 867 spraying and dusting demonstrations were conducted. Sales of chemicals for both spraying crops and pickling of seeds were given in Appendix VI under Insecticides. The Mahali disease in the West Coast was controlled by timely spraying. The ryots in South Kanara are getting used to the methods

as in Malabar. The campaign strengthened by Pest Act against Cambodia cotton pests, the Hairy Caterpillar pest and Palm bud-rot disease were carried out as usual. There were only 13 prosecutions under Cotton Pest Act. The Hairy Caterpillar campaign was run very smoothly particularly because the emergence of moths did not occur in a serious form anywhere. The palm bud-rot campaign continued in three taluks of Malabar with a special staff of one sub-assistant in Mycology and three demonstrations maistris. Out of 5,447 affected cases including 272 balance of last year, all except 846 cases have been operated. The new Government order placing the responsibility on the village officers to trace out cases and deal with them must add to the efficiency of the work especially when the work of the departmental staff would serve the village officers as an encouragement.

6. Observation and Trial Plots.

381 observation and trial plots were conducted during the year to know the suitability of new strains and varieties. Among the new strains, paddy B.K. 10905, B.K. 5783, 5109, 5143 and 2306, cholam strains Nos. A.S. 1055, 1093, 4283 and 29, ragi strains E.C. 593 compared to E.C. 3517 and 3735, cumbu strains P.T. 700 and 2229, tenai S.I. 523 and cotton strains. Co. 920, 4463, 4383 and 3915 were dealt with in them.

Demonstration plots.—1,755 demonstration plots were laid out in the ryots' fields for advertising the advantages of strains and methods decided superior by the trial plots.

7. Work done with other Departments.

The Assistant Directors of Agriculture, attended the periodical District officers' conferences held by the Collectors and gave their co-operation in all possible items of rural uplift work done in the districts. The Agricultural Demonstrators, who are members of the Taluk Advisory Committees, attended such meetings. The demonstrators were regularly attending the teachers' meetings when they were invited to do so and delivered lectures on agricultural subjects. All the staff including the gazetted officers attended meetings of the kind like "Farmers' Day" and "Parents' Day." Co-operative meetings, etc., delivered, lectures on agricultural improvements wherever possible. Every possible assistance was given to Co-operative department in their non-credit activities. The important part of it is especially seed multiplication and distribution. The Tirupur Co-operative Sale Society, the Co. 2 Seed Extension Scheme of Salem, the paddy seed multiplication work of Salem, North Arcot and West Coast, are the important items in which both co-operative and agricultural departments do joint work amicably. The Tiruthala Co-operative Society and Vadvannur Co-operative Society in Malabar district, have also done considerable amount of work to expand the activities of the department. The Mahali prevention Co-operative Society of South

Kanara, worked in close co-operation with the department. The sugarcane expansion work under the co-operative organizations were given all possible help. The demonstrators attended almost all the jamabandi camps and delivered lectures on agricultural subjects. In many cases small shows were also put up and demonstrations were conducted. In the prohibition areas of Salem and North Arcot, the village sangams formed by the Revenue department are being utilized for conducting agricultural propaganda. A municipality and a panchayat board co-operated in manure preparation. Crop cutting experiments on food crops and sugarcane were conducted with the co-operation of the Revenue department as usual.

2. *Unai Agricultural Association.*—This is the third year of the work of the Unai Agricultural Association in North Arcot district. It has 47 members, each one adopting one or more of the several improvements. About 50 per cent of the area under paddy and sugarcane has been brought under new strains and green manure crop while this village was able to spread the new strains of both paddy and sugarcane to an appreciable extent in the neighbouring villages. It distributed 2,624 lb. of kolingi seed and 3½ lakhs of sugarcane setts. Rs. 600—co-operative loan—has been distributed to help poor ryots.

16 agricultural improvement societies and associations have been started and are beginning to function. It is programmed that they as well as the village sangams of the prohibition districts will arrange for several rural exhibitions.

8. Exhibitions and Shows.

125 exhibitions were conducted during the year. They were a very good means of advertising new methods and crops. 437 lectures with and without lantern shows were conducted at all the big exhibitions. The rural exhibitions conducted on the lines laid down by the department by the Tiruthala Co-operative organization, has been fruitful of valuable results. The need for a depot for seed distribution and held up sale of produce automatically arose and the society had to construct a godown with the help of a grant from Government. This has been a very great help for the departmental work. Rural exhibitions conducted by the Kotekar and Panniyanoor societies were not, however, so successful.

9. Livestock.

Advice regarding feeding and housing of animals so as to avoid loss of manure was advocated by the staff. The encouragement indicated in paragraph "C" supra for the spread of fodder cultivation was another part of the work.

10. Sidelines of Farming.

Considerable encouragement has been given to the spread of bee-keeping. 622 colonies were hived by the staff for ryots and 839 empty hives and 26 extractors were supplied to ryots. In most of

the depots and houses of the agricultural demonstrators, bee-hives are kept for advertisement. Poultry-keeping was also encouraged in all possible ways by arranging for the distribution of eggs and birds of the imported types.

11. Loans.

Details of the distribution of implements, etc., made under takkavi loans, are given in Appendix X. They are becoming more and more popular.

12. Publications.

Besides the distribution of large number of free leaflets, 6,333 villagers' calendars and 497 other priced publications were sold to ryots.

III — AGRICULTURAL RESEARCH STATION, TALIPARAMBA.

(1) *Season*.—The South-West monsoon started in time, but weakened in August-September affecting all dry crops. The North-East monsoon was full and timely. The summer showers were late. The season was on the whole favourable. A total fall of 128.64 inches of rain was obtained during the year as against 152.16 inches the average for the last 30 years.

(2) *Wet land*.—Paddy occupied 5.38 acres and gave an acre yield of 2,977 lb.

Sugarcane occupied 76.5 cents. The ratoon crops of October 1937 plantings gave an acre yield of 23.03 tons of canes, while those of February 1938 plantings gave only 19.74 tons. October planting of cane is done in both wet and dry lands as a rainfed crop. This avoids the flowering menace. The 1939 February plantings gave 24.09 tons of canes per acre. Of the different varieties, Co. 419, Co. 421 and M. 55 gave the highest yield.

(3) *Dry land*.—All the crops were hit by the weakening of the South-West monsoon in August-September. Dry paddy gave a poor yield of 546 lb. per acre.

(4) *Fruits*.—The fruit nursery work was expanded. 4,260 graft mangoes and other fruit plants were sold from the farm as against 1,491 of last year.

(5) *Pepper*.—This fared better than it did during the last half a dozen years and the acre yield worked out at 1,230 lb. for the cultivated area and 285 lb. for the uncultivated portion.

(6) *Livestock*.—The work animals and the buffalo herd were in good condition throughout the year. 5 to 10 bee-colonies were maintained on the farm throughout the year and these yielded 32½ lb. of honey.

The Agricultural Research Station served an important centre for the trial, multiplication and distribution of seeds suitable to the West Coast.

COIMBATORE,
30th July 1940,

K. UNNIKRISHNA MENON,
Deputy Director of Agriculture, IV Circle.

ADMINISTRATION REPORT OF THE GOVERNMENT AGRICULTURAL CHEMIST FOR THE YEAR 1939-40.

I submit herewith the administration report for my section for the year 1939-40 (fasli).

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

2. The work of the section is reported under three heads, (i) General (including analytical and advisory), (ii) Teaching and (iii) Research.

The work under general including advisory work was an important feature of the work of the section, and consisted as in previous years of the analysis of samples received and advice rendered in matters connected with the chemistry of soils, manures, feeding stuffs, irrigation waters and human foods from jails, and other agricultural products.

The work on teaching included that on the teaching of Agricultural Chemistry to students of the B.Sc. (Ag.) degree course of the Madras University and to Short Course students in jaggery making and malting, and also the training of Research students working for the M.Sc. degree of the Madras University.

The research work conducted by the section was on original investigations on soil science, bio-chemistry of animals and plants, agricultural industries (i.e.), jaggery making and malting of cereals.

(i) GENERAL : ANALYTICAL AND ADVISORY.

3. The total number of samples received during the year was 1,677 against 2,454 in 1938-39 and 2,544 in 1937-38. The number of samples received from officers of the Agricultural department amounted to 829 and from other Government departments 218.

The total sum of analytical fees received was Rs. 348-8-0, consisting of Rs. 202-8-0 from members of the United Planters Association of South India and Rs. 146 from ryots and other private parties.

Samples of soil were analysed and reported on to the Chief Engineer for Irrigation in connexion with the Pundi Reservoir Scheme to determine their suitability for formation of the embankment for the earthen dam.

Meteorological data were collected as before from the observatory in the Agricultural Research Institute and a monthly summary of weather conditions in the presidency was prepared and published in the Madras Agricultural Journal.

(ii) TEACHING.

4. Lecture classes for the students of the three years of the B.Sc. (Ag.) degree course numbered 269 of one hour each and 178 practical classes of 338 hours duration.

Short courses were conducted on malt making in September 1939 for a period of fifteen days and attended by eleven students and in jaggery making in February 1940 for fifteen days attended by 13 students. Both the courses included lectures and practical classes in the subjects.

(iii) RESEARCH: SOILS.

5. *Reclamation of alkaline soils, Kulittalai taluk.*—The work at Mettumarudur in the Kulittalai taluk, Trichinopoly district, on the reclamation of alkaline soils was continued.

During the year under report a crop of green manure (Dhaincha) was raised and harvested in late August. This year the yields of green manure were satisfactory in plots treated with gypsum and sulphur and some crop was obtained even in the control plots which were flooded and washed out. The unwashed control plots grew no crop at all.

The green manure was ploughed in and a samba crop of paddy was harvested on 27th January 1940. Crop yields in the treated plots were satisfactory averaging 2,500 lb. grain per acre in the treated plots, the plots treated with gypsum giving yields up to 3,000 lb. per acre. The control plots which were flooded and drained out showed a marked improvement this year having yielded a fair crop, while the unwashed control plots, not drained out, gave no crop at all.

The chemical analysis of the surface soils from the plots collected after harvest of paddy showed the same trend as the crop yields. The soils in the treated plots had further improved in their total soluble salt, carbonate and bicarbonate contents, exchangeable soda and potash and pH values over last year's results and may now be considered almost normal soils for crop growth, while the chemical composition of the control plots remained much the same as at the beginning of the experiment.

The composition of the sub-soils (12"—24") remained much the same as before, with a slight improvement in the treated plots; but it is expected that with continued cropping and normal drainage being established, the condition of the sub-soil will improve gradually.

The work done during the year under report marks the concluding stages of the investigation. It has been shown that by treating the highly alkaline soils of the Kulittalai taluk with gypsum or sulphur, they could be made to yield normal crops of paddy provided good drainage was provided. The cost of such reclamation was in the neighbourhood of Rs. 100 per acre. Based on the results of this investigation it is proposed to start demonstration plots at various centres in the area commanded by the

High Level channel, to show how alkaline soils can be reclaimed by adopting similar methods. A scheme was therefore submitted in June 1940 for the laying out of demonstration plots at three centres in the area. The location of the plots was decided on by the personal inspection of an assistant from this section and it was decided that plots be laid out at Pillaipalaiyam, Nangavaram and Vaiganallur villages.

6. *Study of the delta soils.*—A study was started during the year on the soils of the Kistna and Godavari deltas, as regards their chemical composition, profile characters and their genetics. Soil samples were collected from the representative areas in the Kistna and Godavari deltas, and also at places where the two deltas meet. It was seen that the soil profiles of the two deltas were markedly different, those of the Kistna delta being of great depth and uniform profile characteristics while those of the Godavari delta were admixtures of layers of clay and sand. The two deltas are apparently of different origin, being derived from different catchments. The analysis and characterization of the soils are in progress.

7. *Studies on the black soils.*—This study on the origin and geochemistry of the black soils of Madras Deccan was continued. The fractions of some typical profiles of black and red soils were subjected to study to arrive at a characterization of the two types of soils which are often formed side by side. The black soils were found to be sharply differentiated from the red soils by the S_1O_2 R_2O_3 ratio of the clay complex. The ratios in the black soils were in the neighbourhood of 3.0 while those for the red soils were about 2.0. The black soils were found to be homogeneous soils by reason of their profiles being uniform and without any sign of unconformity at different depths and had a uniform composition at all depths, thus ruling out the possibility of their being transported soils.

The study was further extended during the year to an examination of the underlying rocks in typical black soil and red soil areas. The area between Siruguppa and Bellary and Bellary and Adoni was subjected to a traverse study and rocks collected wherever outcrops were available; a large number of rock specimens were collected and twelve typical samples analysed for their proximate constituents. There was not much difference in the composition; the rocks containing Hornblende had a high lime and sodium contents and were low in potash, while the red and white granites had a low lime content and high potash content. The study is in progress.

8. *Organic matter in black soils.*—The studies on the organic matter in black soils were continued and samples of soil from Siruguppa where green manure had been added by being ploughed into soils which were irrigated, unirrigated and cropped and not cropped were examined. The organic matter content and carbon/nitrogen ratio were determined. It was seen that no appreciable

increase had occurred in the organic matter content and the C:N ratio was unaltered. Further work is in progress with larger doses of green manure in the same plots.

9. *Determination of exchangeable bases in alkaline soils.*—The determination of exchangeable bases in alkaline soils has always been a matter of difficulty, added to by the presence of calcium carbonate, and the usually adopted methods are not applicable to such soils. The method devised by Dr. Puri at the Irrigation Research Laboratory uses ammonium carbonate as the leaching solution. The method is simple of application and rapidly carried out. This method was used in the study of the reclamation of alkaline soils (reported in paragraph 5 above) and when compared against the usual method gave very satisfactory values for sodium and potassium.

(iv) MANURES AND MANURING.

10. *Effect of manuring seed bed on paddy crop.*—The experiment in B block of the Central Farm, Coimbatore, to test the effect of manuring of seed bed on the behaviour of the crop in fully manured, half manured and no manured transplant fields was continued, this being the second year. The experiment gave statistically significant results as it did last year showing that seedlings from heavily manured seed beds did the best in the transplant field even when it was manured to a lesser degree than normal, than seedlings from the half-manured or no manured seed bed. The experiment will be continued for another year to confirm this result.

11. *Experiment on manuring and spacing with paddy.*—A new experiment was laid out in A and B blocks of the Central Farm to study the combined effect of manuring and spacing on the yield of paddy and to test the effect of heavier manuring with wider spacing. The first year experiment gave yields which were statistically significant. The results of subsequent years are awaited before comment is made.

12. *Making of composts.*—The method of making composts, recommended at Bangalore and known as the "Bangalore" method was compared with the usual method worked out at Coimbatore and known as the "Coimbatore" method and was tested by this section and also at some research stations. The results of the trial showed that while the Coimbatore method gave a compost of better quality but lesser quantity, the Bangalore method gave compost of lower quality but better quantity. The material used was estate rubbish in both cases.

(v) PLANT NUTRITION.

13. *Effect of manuring on crop quality.*—These studies were continued with ragi from the new permanent manurial plots and maize grown in pot culture. The result of this year's study has

confirmed those previously obtained on the nitrogen metabolism of the plants with differential manuring. The carbohydrate metabolism was also studied and showed that it was equally, if not more, profoundly influenced by this type of manuring. The plants manured with ammonium sulphate showed a high content of water soluble nitrogen as nitrate nitrogen and a lower content of carbohydrate, hence in the final stages of the life of the plant, protein synthesis did not occur but nitrogen still existed as inorganic nitrogen, while with the cattle-manured plants both types of metabolism would seem to have proceeded normally and resulted in normal synthesis of protein.

14. *Studies on quality in Virginia tobacco.*—Preliminary studies on the problem of quality in Virginia tobacco in the Guntur district were started with a view to study the conditions for the production of high quality leaf for cigarette manufacture. A number of samples of Virginia leaf and country leaf was examined for the usual chemical constants, and also for electrical conductivity to measure the soluble salt content. It was seen that the high grade Virginia leaf had low nicotine and low soluble salt content while the lower grades of leaf had high nicotine and high soluble salt content. When the soils on which they were grown were also analysed for their soluble salt content, it was seen that the best quality leaf was produced on soils with a low soluble salt content. Tobacco quality in Virginia leaf seems to be associated with a diminished metabolism of the plant and with a soil free from soluble salts.

15. *Studies on quality in coffee.*—This study was started at the instance of the Marketing Adviser to the Government of India to distinguish between high grade coffee powder made from the *C. Arabica* and low grade powder from *C. Robusta*. A preliminary study of chemical characters showed that *C. Arabica* had a high oil content when compared with *C. Robusta* (both in the roasted powdered state as marketed). Further work is in progress.

(vi) ANIMAL NUTRITION.

16. *New feeding standards for working bullocks.*—The suggested system of rationing of working bullocks as formulated by this section was tried out on all the Agricultural Research Stations of this department. Reports on the working of the standards were received during the year and a consolidated report was submitted in the month of May 1940. Reports were received from 23 agricultural research stations on the suitability of the standard ration and in most of the reports, it was stated that the standard rations were suitable for working animals and did not result in any untoward effect on the animals.

There was however some doubt regarding the application of the "slab system" for deciding the intensity of work and the ration suitable to it. In some stations the heavier animals of

the Ongole breed fell off in weight. A revised system of ration was therefore recommended reducing the four "slabs" "Maintenance," "light," "moderate" and "Very heavy work" to "Maintenance," "Medium" and "Very heavy work," and a flat rate increase of $\frac{1}{2}$ lb. concentrates to all heavy animals was recommended.

17. *Effect of work on the protein metabolism of bullocks.*—A further series of experiments on the effect of muscular work on the protein metabolism at low levels of protein feeding were started, with a view to study the nitrogen metabolism and also the metabolism of phosphoric acid and sulphur with a view to determine whether tissue breakdown had occurred during muscular work. Work is in progress.

18. *Dynamometric measurement of intensity of work during mhoting.*—Preliminary trials with a dynamometer have shown that during mhoting, the total work performed by a pair of bullocks during eight hours is in the neighbourhood of 2,000,000 foot pounds (2×10^6 foot pounds). The work is done in a rhythmic pulse, increasing during the upward pull of the bucket, and the animals walking down the ramp, reaching a maximum just before discharge of water from the bucket and falling rapidly during fall of bucket into the well and backward walking of animals up the ramp.

(vii) MICROBIOLOGY.

19. *Microbiological population of black soils.*—A study was started during the year on the microbiological population of the black soils of the Madras Deccan. Samples of soils from the Agricultural Research Station, Siruguppa, were examined for total bacterial counts, and for ammonifiers and nitrifiers. The micro population was seen to be very low being in the neighbourhood of 700,000 per gram of soil while the population for other soils was appreciably higher being 7-10 times this number. This low value for the microfloral population is apparently specific for the black soils of the Deccan. Further work is in progress.

20. *Fermentation of molasses for power alcohol.*—The work on the fermentation of molasses for the production of power alcohol was concluded during the year with a study of the conditions for the maximum production of alcohol from molasses. It was found that with a 40 per cent molasses mash, with mono-calcium phosphate added at 0.1 per cent by volume, and urea at 0.2 per cent by volume and adjusted to $pH 6$, the mash if incubated at $30^\circ C$, sterilized with steam and inoculated with 10 per cent inoculum gave an yield of 22 per cent alcohol by weight or 27.5 per cent by volume.

21. *Berseem and Berseem culture.*—Berseem was grown in Field No. 59-A at the Central Farm and gave a total of 28,000 lb. of cuttings per acre. The nodule culture of berseem was distributed to 17 Research Stations.

(viii) MALTING OF CHOLAM.

22. *Clinical tests on malt foods in hospitals.*—Clinical tests were carried out in a number of private and mission hospitals on a variety of types of patients; the reports on these tests have been favourable in all cases where the food was prepared according to the prescribed standard method.

23. *Malting of varieties of cholam.*—Seven strains of cholam from the districts and eight from the Millets Specialist were tested for malting. They were all found to be satisfactory.

24. *Blending of malts for making foods.*—Rice and cholam malts in the proportion of 1:1 were found to blend satisfactorily in the making of malt foods.

25. *Malt making plant.*—A plant, for making malt from cholam on a large scale and suitable for a commercial scale manufacturer was constructed by the Industrial Engineer to Government at Madras from data supplied by the section and a preliminary run of the units was conducted in May 1940. Some slight modifications were suggested and are being carried out.

26. *Demonstration of malt in rural areas.*—Malt making and biscuit making from cholam was demonstrated in the Chittoor district and is now being carried out at a number of village centres by the Rural Reconstruction Associations in that district.

(ix) ACTIVE CARBON AND JAGGERY.

27. *Active carbon from paddy husk.*—Active carbon was prepared on a large scale for the use of departmental officers and limited quantities sold to the public for jaggery making. The demand for active carbon continues to be high.

28. *Active carbon from groundnut husks.*—Attempts were made at preparing active carbon from groundnut husks. Various methods used produced a carbon of high grade but the cost of production was considerably higher than that for paddy husk carbon.

29. *Preparation of cube jaggery from low purity cane juices.*—Experiments conducted showed that by a slight modification of the usual process, cube jaggery could be made from low grade juices. The modification consists in the adding of small quantities of super-phosphate and lime and boiling and removing scum and then allowing the boiled juice to settle and syphoning off the supernatant liquid and concentrating as usual. A good quality jaggery is obtained.

30. *Clarification of oils.*—It was found that by heating castor oil of ordinary bazaar quality with 2-3 per cent active carbon to about $60-70^\circ C$ for half an hour and then filtering off the oil, gave a clear oil fit for making toilet oils and medicinal oil.

COIMBATORE,
1st August 1940.

P. VENKATARAMAYYA,
Government Agricultural Chemist.

ADMINISTRATION REPORT OF THE PADDY SPECIALIST FOR THE FASLI YEAR 1939-40 (FROM 1ST JULY 1939 TO 30TH JUNE 1940).

Charge and staff.—I remained in charge of the section, continuing to control the two sub-stations at Maruter and Pattambi throughout the year. Sri K. Venkataraman and Sri Samuel Jobitharaj were in direct charge of the sub-stations up to the 1st of September 1939 when the two posts of Superintendents were retrenched. Thereafter, the sub-stations were put in charge of two Senior Assistants in the section.

2. Season.—At Coimbatore, but for the ill-distributed rains received during the north-east monsoon, the rainfall was normal. Water-supply from the tank though late to commence with, was more or less adequate till the maturity of the crop. The average acre yield of the station was 2,474 lb. which is less by 93 lb. compared to the previous year when the rains were scanty and water-supply precarious.

The season at Maruter was not propitious for both the first and second crop. The south-west monsoon was late and feeble, recording 16 inches as against the average of 28 inches; while, the north-east monsoon brought in its train torrential rains recording 32 inches compared to the normal receipt of 14 inches. The first crop paddy therefore suffered for want of adequate rains in its early growth and by excess of rains in its flowering and setting stage. The average acre yield worked out to 2,150 lb. as against 2,783 lb. recorded in the previous year.

At Pattambi, the season was not also quite favourable for paddy. There was a total rainfall of 97.2 inches in 126 days, the average being 102 inches in 132 days. Reviewing the annual yields of paddy at the Pattambi station for the past ten years into two five-year periods, the outturn during the second period recorded an increase of 39.9 per cent over that of the first five-year period.

Average for the first five years ... 77,870 lb.

Average for the second five years ... 1,08,927 lb.

Percentage increase—39.9.

3. Plantings.—At Coimbatore, 9,282 units in the first crop and 450 in the second crop were planted and studied, while at Maruter and Pattambi, the units numbered 6,464 and 7,636 respectively.

4. Seed distribution.—The total quantity of seed materials transferred to the Circle officers and sold direct to ryots from the stations are noted below:—

Particulars.	Paddy Breeding Station, Coimbatore.	Agricultural Research Station.	
		Pattambi.	Maruter.
	LB.	LB.	LB.
Paddy seed	36,397	76,100	55,437
Sugarcane setts	..	..	48,810
Plantain suckers	..	71	433
Pineapple suckers	..	1,650	..
Soyabeans	..	..	70
Groundnut A.H. 25	..	995	..
Groundnut A.H. 45	..	1,071	..

5. Economic work—Improvement of local varieties by pure-line selection—(a) Strains released for distribution.—During the year under report three strains Co. 13, Mtu. 14 and Ptb. 12 were released for distribution and their particulars are given below:—

Station from which evolved.	Variety from which evolved.	Culture number.	Strain number for release.	Average percentage increase over ryots' bulk.	District for which they are recommended.
Paddy Breeding Station, Coimbatore.	Arupatham-kodai.	5109	Co. 13	19	Madura and Coimbatore.
Agricultural Research Station, Maruter.	Atragada.	3156	Mtu. 14	16	Godavari.
Agricultural Research Station, Pattambi.	Chitteni.	1303	Ptb. 12	12.7	South Malabar.

(b) Cultures under trial awaiting release.—Of the two hybrid strains 10905 and 10783, the former has established its merit in the Namakkal and Tiruchengode taluks of Salem district, against local *sadaisamba*. In the Collair area, the trial of these two cultures, which appeared to be promising in the previous trials, failed on account of the abnormal floods. The trial of the blast resistant strains 10998, 11348 was concentrated in Cuddapah and Nellore districts where the disease is noticed to be more or less endemic. The year having been favourable for the spread of the disease in the local susceptible varieties, both 10998 in Cuddapah and 11348 in Nellore have attracted the attention of a large section of the cultivators in the localities where the demonstration was conducted, as these were outstanding from the view point of yield and resistance to the disease. Hybrid cultures D.W. 10 and 41 named as *badava kusuma* (because of the similarity of grain size and colour to *kusuma* and their suitability to the low-lying areas) isolated at Maruter from a natural cross spotted in a floating type, were under observation plots in low-lying areas in the Narasapur and Bhimavaram taluks of the West Godavari district. Reports from the districts and the results on the station are in favour of D.W. 10. The fact that a demand for this variety in the locality of the trial had to be met with is in itself an index of its performance. Another hybrid culture, 57, a non-lodging

and non-shedding type for the *dalwa* or second crop under the Godavari irrigation system was found to yield better than Mtu. 9 under different periods of sowing and planting.

(c) *Cultures under trial for the first year in the district.*—Four promising cultures in *vadansamba*, three in *sirumani* and three in *vellaikar*, isolated at Coimbatore were under trial in Chingleput district where the selections were originally made. Though the performance of the cultures in bulk observation plots in the first two varieties were distinctly higher than the local, they did not come up to the expectation in the regular yield trials. In the case of *vellaikar* cultures, two of them consistently maintained their ascertained merit. From Pattambi, two cultures of *kayama*, a major variety of South Kanara were under trial in four centres. In two of the centres and in the trial on the station, the cultures recorded significantly higher yields than the local ryots' bulk; while in two centres, they were on a par with the control. Dwarf mutant strain isolated from X-ray GEB.24 was sent for trial in places where GEB.24 is now cultivated. It is observed from the results of the trial at Hospet, Salem district and in the Periyar area, that the dwarf mutant strain yielded higher than the original GEB.24 in both grain and straw.

(d) *Pure-line selection work in progress.*—At Coimbatore, eighteen of the 36 cultures in the three *sannavadlus* of Chittoor district were marked out for further trial. Forty-eight cultures in *Rangoonsamba* of Erode and 41 of the *manavari* group of Salem were fixed to take up yield trials for the first year. Work on *bangaratheegala*, a fine reputed variety of Kurnool, was commenced during the year. In the contamination study of well established strains in cultivation for some years, it was noticed that strains isolated from well known local varieties were pure, while in a hybrid strain Co. 1, identifiable variations were noticed.

At Pattambi, 1,472 pure-line cultures in the first crop and 178 in the second crop, isolated in half a dozen local varieties were studied and 608 and 100 cultures respectively were carried on for further study.

At Maruter, 638 cultures isolated in *pedda atragada*, *kusuma* and *prayaga* of the Kistna district were examined in the field and promising cultures carried forward for further work. Cultures in the *swarnalu* and *kesara*, two minor varieties of Godavari district did not prove superior to Mtu. 9 and were discarded. Selection work for evolving high yielding strains in varieties grown under rain-fed conditions was taken up in the tract itself through the kind courtesy of Sri Gangarazu of Mallavaram village in the Kovvur taluk for want of typical land on the station. Just a year's work had been done and it is too early to judge the outcome of this piece of work. Field trials of the cultures belonging to 12 varieties brought from Berhampur were continued. Short duration varieties from the southern districts once again failed to approach the local strain in yield.

6. *Hybridization for crop improvement.*—At Coimbatore, progenies belonging to 10905 and 10783, the two hybrid strains isolated from a cross between Co. 3 × Burma type, grouped for size of grain, were compared for yield. Two groups C and D of 10905 and group A of 10783 yielded higher than the original cultures 10905 and 10783. Selections from Co. 4 × *korangusamba* cross isolated for disease resistance were examined and 41 pure breeding cultures were fixed for yield trial in the coming season. Of the secondary selections from the three blast resistant hybrids of GEB.24 × *korangusamba* cross, isolated for size of grain and good filling, seventy-seven cultures were found to be disease resistant and high yielding. A large number of progenies of the various crosses made with economic ends were in different stages of study. At Maruter, twenty-eight cultures extracted from natural crosses were under study. F₁s of 48 sets of artificial crosses made with the ultimate purpose of isolating strains combining desirable characters were studied and crosses identified.

At Pattambi, progenies of crosses made between Coimbatore strains and local strains were studied in their respective generation and suitable selections made for further study. Progenies of the cross between GEB.24 × *thekkancheera* did not come up to the expectation and were therefore discarded.

7. *Economic mutations from X-ray GEB.24 progenies.*—Yield trials of the four dwarf mutants 5780 to 5783 were continued for the third year. Owing to premature lodging and rice bug attack no valid conclusions could be arrived at. In order to see if close or wider spacing would prevent premature lodging a simple spacing experiment was laid out to compare the relative reactions of different spacings on yields and lodging, between GEB.24 and the dwarf mutants. It was noticed that the dwarf mutants in closer spacing not only yielded higher than GEB.24 but also remained without lodging, while GEB.24 responded well to wider spacing. At Maruter, the dwarf mutants had proved better for unmanured conditions, while GEB.24 excelled the dwarf mutant strains under manured conditions, presumably due to their premature lodging. Reports from the district are in favour of the dwarf mutants for the reason they are having the requisite conditions, viz., close planting and poor manuring. In the second set of tall and late promising selections from X-ray materials, further selections to fix the purity for size of grain were under examination. It was possible to fix 32 pure breeding lots to undergo preliminary yield trials.

8. *Improvement by introduction.*—A Hyderabad variety, *kasipichodi* is maintaining its popularity in the Godavari district as an early maturing second-crop variety. It is also reported that it is gradually gaining ground in the Chingleput district. Patnai types 672 and 673 have yielded 28 and 23.5 per cent respectively over local *Rangoonsamba* at Erode in the first-crop season. I understand that T. 672 has already extended over 200 acres round

about the place of the trial. In the Salem district, its high yield of grain and straw and its shortness of duration to any of the medium duration local varieties have appealed to the cultivators. However, they are poor yielders under late planted conditions and in the second-crop season. *Basumathi*, the reputed variety of Dehra Dun received in 1938 for trial, was multiplied at Palur and Coimbatore. Being a variety chiefly in demand in the City of Madras, the trials were undertaken in the Chingleput and Chittoor districts. Reports were not consistent in the first year of the trial. It is proposed to pursue this work for some years to fix the suitable area for growing this variety.

9. *Type collections*.—At Coimbatore 1,705 varieties have been registered in the collections. At Pattambi and Maruter 318 and 220 respectively were under observation. Short duration varieties from China are being acclimatized at Palur and Ambasamudram. At Pattambi, inter-variety trials have established the superiority of the strains against some of the minor local varieties of similar duration. At Coimbatore, 11348 and Adt. 5 have definitely proved for two years their superiority over local *senduriki*. Trials in the districts have been arranged in the next season. At Maruter, none of the outside varieties tried, excelled the local strains.

10. *Agronomic studies*—(a) *Cultural experiments*.—The results of the spacing experiments at Coimbatore and Pattambi point out that the grain yield is influenced by spacing—closer the higher—while the yield of straw is influenced by the number of seedlings planted per hole. In a subsidiary experiment, no significant difference in yield between 4, 6 and 9 seedlings were observed and it may be said that planting four seedlings per hole seems optimum and economical. Planting wider than 12 inches by 12 inches is definitely unremunerative. It was also observed that close planting and increase in the number of plants per hole help to mature the crop earlier by about a week compared to wide planting and in singles. In a bulk trial over two acres, planting 12 inches apart with four seedlings per hole recorded the same outturn as 6 inches by 6 inches singles. It therefore appears that the choice of the spacing and number of seedlings per hole should be determined by the local conditions, such as weediness of the plot, water-supply, availability of labour and soil conditions. Close spacing is to be recommended where the plots are weedy, water-supply uncertain, and labour cheap. On the other hand, planting in bunches per hole, fairly wide, should be preferred in places where labour is scarce, desirable puddle cannot be maintained in advance and water-supply is adequate.

At Pattambi, experiments on transplanting versus broadcasting was concluded with the finding that broadcasting with the first heavy summer shower definitely yields higher than transplanting after the monsoon had commenced, while late broadcasting yields less than transplanting. The choice of the method under West Coast conditions should be determined by the season.

If the summer showers are adequate it should be taken hold of in time. But if summer showers fail or if missed, recourse to transplanting instead of following the routine method of broadcasting for the first crop may be had.

(b) *Manurial experiments*.—At Coimbatore, the application of superphosphate at planting only on a basal dressing of green-leaf for the second year recorded significantly higher yields over that applied later in the growth period. In a subsidiary experiment conducted to find whether the decomposition of the green-leaf should precede the application of superphosphate, it was noticed that there seems to be a necessity for the decomposition to precede the application of super as the application of both leaf and super at planting yielded less than when it was applied 10 or 20 days after the application of leaf. In an experiment on the application of sulphate of ammonia as a top dressing over a basal dressing of green-leaf in part doses, the differences between the full single dose at planting and divided doses were not significant, though the response for the different levels of nitrogen, 20 lb., 40 lb. and 80 lb. was maintained. The differential reactions noticed between the first and second year, suggest that the variations in the two seasons may have had to do with the responses to the different treatments. In the previous year, the rains were scanty and water-supply inadequate. In the year under report, the rain during the growth phase of the crop was heavy and continuous and water-supply quite adequate. This surmise needs confirmation. As between castor or groundnut cake and sulphate of ammonia, similarly as between leaves of different kinds—dhaincha, wild indigo, *Sesbania speciosa*—it does not matter which is applied, so long as they are applied on nitrogen basis required for the paddy crop. There is a significant response to each increase in their levels of nitrogen applied (say 15 to 30 lb. and 30 to 45 lb. of nitrogen). The choice of the manures is only a question of cost and easy availability.

At Pattambi, the results of the various manurial trials once again consistently confirm the findings already arrived at. A basal dressing of green leaf at 4,000 lb. or groundnut cake to supply 30 lb. nitrogen supplemented by sulphate of ammonia to supply 15 lb. nitrogen or by itself at 30 lb. nitrogen contribute to increase the outturn between 25 to 40 per cent over no manure. However, under the current prices of cake and sulphate of ammonia at the war prices, the application of green leaf alone is economically sound. So far as the application of cattle manure and compost to rice cultivated under swamp condition is concerned, the results of the first year's experiment point out their poor response compared to either green leaf or sulphate of ammonia. Even among the different doses of compost applied, there is appreciable increase in yield, only when the dosage is increased to over 15 tons per acre.

11. *Second-crop problem of the Godavari irrigation system*.—Past experiments on the station and in the districts for two

seasons had shown that the crop raised by planting seedlings raised early in semi-wet nurseries or under dry nursery system, was found not only to get over the adverse seasonal condition prevailing in January in the Godavari deltas by quick establishment, but also yields as well as the crop planted late with seedlings raised under normal wet condition. Bulk observation plots were planted to see when the water-supply could be cut off for crops planted at different dates. It will be seen that by planting between the 19th and 29th of January, the water-supply could be cut off by the middle of April without affecting the yield.

Date of planting.	Age of seedlings.	Date of last wetting.	Date of flowering.	Grain yield per acre.
				LB.
19th January 1940.	45 days.	15th April 1940.	1st April 1940.	2,174
29th January 1940.	45 "	16th April 1940.	4th April 1940.	2,237
9th February 1940.	45 "	22nd April 1940.	8th April 1940.	1,814

12. *Electro-culture*.—At Coimbatore and Pattambi, the final yield of the rice crop was not affected by the previous treatment of seed, whether dry or germinated. At Maruter, however, as in the previous year, 11 per cent increase over the control was recorded by wiring the plants and sparking the same periodically. In another experiment, the crop raised from seeds sprouted and sparked, gave 7.6 per cent in Mtu. 3. While with a late variety, the differences were not significant. Similarly the effect of jacketing and sparking had no effect on the yield of plantains.

13. *Economics of rice growing*.—Cost of producing one-hundred-weight of paddy at the two rice sub-stations are given below. The high cost of production recorded at Maruter for the second crop was due to the reduction in yield compared to the previous year.

Cost of producing 1 cwt. of paddy.

Agricultural Research Station.	First crop.			Second crop.		
	RS.	A.	P.	RS.	A.	P.
Pattambi (single crop land)	1	4	0	..	..	..
„ (double crop land)	1	8	0	1	12	0
Maruter	1	5	0	2	5	7

14. *Irrigation experiments*.—This experiment was continued as in the previous year at Coimbatore and Maruter. At Coimbatore, though the differences in yield between the treatments are not significant for grain and straw, yet there is a suggestion that if adequate film of water is to be maintained for about a month after planting, the supply during the after growth of the crop can be made at 12 days interval without affecting the final yield of the crop. However, larger supply of water at wider intervals, say at 18 days, right from the time of transplanting is definitely detrimental to the crop. At Maruter, the supply of water for the second crop at a constant duty of 70 was found firstly to prolong

the period of transplanting, thereby reducing the yield of late planted units; and secondly this poor supply to alkaline lands of the farm was harmful to the crop grown and the one following it in the main crop.

15. *Quality work in rice*.—The experiment on the effect of manures on the thickness of the aleurone layer was continued with two doses in each of cattle manure, poudrette, and green manure to supply 30 to 60 lb. nitrogen. The results of the experiment while confirming the findings of the previous year, showed that an increase in the thickness was also obtained with the increase in the dosage of the manure in the case of green manure and poudrette but not in the case of cattle manure. These findings are to be confirmed.

Investigations on the usefulness of the alkali test to differentiate new and old rices were commenced during the year. So far, no clear-cut indications were obtained to differentiate the disintegration and gelatinization of the rices produced by this treatment. This work will be continued.

16. *Fundamental studies—Inducing mutations*.—Old seeds of three strains, Co 10, GEB. 24 and Co. 8 kept under cold storage from 1936 were subjected to temperatures, 75°C and 80°C. Seed kept at 80°C. failed to germinate. The other set germinated normally. Individual examination of the progenies did not result in spotting out any plant different from the parent. The progenies are being carried forward to see if mutants are thrown out in the second generation. In Co. 8, from the same material, kept at 50°C for a period of a month, a highly semi-sterile triploid mutant was spotted out. After a number of attempts, it was possible to induce the production of tetraploid shoots in rice by treating the seeds with 0.1 per cent solution of colchicine for 2 hours. During the year, a tri-specific hybrid was obtained, by crossing the F1 sterile hybrid (O. sativa: n=12 × O. officinalis n=12) with O. eichingheri: n=24. As this hybrid also is highly sterile, attempts are being made to restore fertility by doubling the chromosome with the help of colchicine treatment of shoots of the F1 hybrid plants.

17. *Other crops*.—At Coimbatore, tomatoes fetched a revenue of Rs. 47-1-0 and 1,738 coconuts harvested from 104 trees, receipt of Rs. 54-5-0.

At Pattambi sugarcane variety Co. 419 for the double-crop wet lands and Co. 408 for the *palliyal* area were found to be the best of the varieties tried. During the year, the area under pine-apple was increased by an acre. By sale of 833 fruits of ke and 711 of mauritius, a sum of Rs. 160-12-0 was realized. Experiments on spacing and manures for pine-apple are still in progress. Decent crops of Co. 2 and *podupathy* cotton could be grown in *modan* lands but for the high damage caused to the ripening bolls through field rats. The two groundnut varieties A.H. 2

and A.H. 45 recorded an yield of 2,610 lb. and 1,617 lb. per acre respectively. Redgram as a mixture in pine-apple and paddy was grown with some success. Castor also is being grown on the station as a pure crop. Being slow in the initial growth, its value seems to be more as a mixture crop than as a pure crop. It is being tried as mixture with *modan* paddy, in the coming season.

At Maruter, the sugarcane crop of Co. 419 gave 42 tons per acre. The merit of Co. 419 for the delta area where the young cane crop, two or three months old, had to be maintained without a single irrigation for a period of six to seven weeks, was well appreciated in the summer of 1939. Co. 419 alone remained green while the local varieties appeared almost scorched up. The average weight of *karpura chakrakeli* plantain bunches over an acre worked out to 37.5 lb. per bunch.

The cost of production of crops grown in the rotation block was as follows for the year 1939-40 :—

Block.	Crop.	Yield per acre. LB.	Cost of production			Net profit per acre.			
			Unit	RS.	A. P.	RS.	A. P.		
1.	Paddy.	Grain—3,192 } Straw—4,700 }	1 cwt.	1	3	0	66	1	10
2.	Plantains	Ratoon—16,211	1 „	0	15	6	54	12	2
3.	Do.	Planted—28,145	1 „	0	12	0	106	6	4
4.	Sugarcane (average of varieties).	33 tons.	1 ton.	11	1	0	168	2	0
5.	Paddy.	Grains—3,004 } Straw—4,700 }	1 cwt.	1	6	10	55	9	6

18. *Fodder crops*.—The trial of *berseem* (Egyptian clover) and *shaftal* (Persian clover) was undertaken for the first year and it was successful only at Coimbatore. Both of them are found to thrive well between November to April in Coimbatore. The first cutting is obtained two months after sowing and thereafter a cutting for every three or four weeks, according to the fertility of the land and irrigation supply. Initial treatments of the seed with the bacterial culture seem to increase the tonnage.

19. *Exhibitions*.—Besides contributing to the calls from the districts, the section directly participated in the exhibitions held at the following places :—

The College Day and Conference, Coimbatore;

The Cattle Show at Tiruppur; and

The All-India Swadeshi Exhibition at Madras during Christmas.

The valuable materials sent to Madras were lost in the fire accident.

20. About 20,000 lb. of hand threshed paddy straw was transferred to the Central Jail, Coimbatore, to prepare packing cases for glass bottles. This is the first time that paddy straw is being utilized for this purpose.

21. *Publications*.—During the year one paper from the section on “the inheritance of floating habit in rice” was sent for publication to the Imperial Council of Agricultural Research.

COIMBATORE,
4th August 1940.

C. R. SRINIVASAN,
Paddy Specialist.

ADMINISTRATION REPORT OF THE COTTON SPECIALIST FOR THE YEAR 1939-40 (FROM 1st JULY 1939 TO 30th JUNE 1940).

Charge.—I continued to be in charge of the section throughout the year.

2. *Staff.*—Assistant Dr. Sankaran was deputed to the Indian Central Cotton Committee, to work as cotton botanist in Sind. Farm Manager Sri N. C. Tirumalacharya, was transferred to Srivilliputtur to help in the working of the cotton seed multiplication scheme at Srivilliputtur. Assistant Sri R. Balasubramania Ayyar was gazetted and placed in charge of the Cocanadas Cotton Breeding Scheme.

3. The Government were again pleased to sanction four temporary posts of fieldmen for two months for the conduct of yield trials in the districts.

4. *Season.*—The total rainfall for the year was 10" above the average and yet it was not favourable to cotton crops due to bad distribution. There were heavy downpours and continuous drizzles in October and November resulting in much loss of water by surface run-off. These were followed up by a long drought extending over five months. As a result, the cotton plants had a tardy growth during the seedling stages and suffered from inadequacy of moisture in the sub-soil during the later stages. The yields which gave good promise of being extraordinary in January, fell down in March as a sequel to continuous dry weather. The rains in April and May were above the normal quantity and were of little benefit to the main productive phase of the crop. Cholan crop alone fared exceedingly well.

5. *Work done during the year.*—As in previous years, it consisted of two parts—one relating to the section and the other concerning problems financed by the Indian Central Cotton Committee, Bombay. Two generations of crops, one at Coimbatore and the second at Srivilliputtur, were again raised in order to speed up the breeding programme.

6. *Work of the section.*—Full particulars of work done are furnished in the annual report of the Cotton Breeding Station, Coimbatore. Only a summary is presented here.

7. (a) *Improvement of 'Cambodias'*—Three newly evolved hybrid strains were compared for yield with strains 920 and CO.2 at Srivilliputtur during the summer, and at Cotton Breeding Station as well as at eleven centres in Coimbatore, Salem, Trichinopoly and Madura districts, during the north-east monsoon. Strains X 3915 and X 4383 again proved to be superior to 920 and

CO.2 when grown in hot weather. The Director, Technological Laboratory, Bombay, reported that X 3915 could spin up to 50's and could be valued equal to the cottons imported from Uganda. Their lint got actually a premium of Rs. 25 per candy of 784 lb. over that of Cambodia. The growers acknowledge that they are benefited to the extent of Rs. 25 per acre by growing these strains. These strains were again reported to be doing well in South Arcot and Kurnool districts and also in parts of Mysore State. In Salem district X 3915 excelled CO.2 in two out of four trials and was equal to it in the other two. Arrangements were made to grow them over an area of a thousand acres under seed farm conditions with the object of covering the entire area of 13,000 acres under summer Cambodia with these two strains. They promise to be good substitutes to groundnut in years of low prices. Their performances when grown during the north-east monsoon were not, however, so brilliant as in summer, indicating them to be susceptible to photoperiodism.

8. Strain 920 continued to be most cosmopolitan of all the Cambodia strains evolved so far. It had fared well in summer as well as in cold weather. In Coimbatore district it had given an average increase of eleven per cent over CO.2 in thirty-nine trials conducted throughout the district from 1934 to 1939. It is, however, a bit coarser and shorter than CO.2 and has the drawback of being affected by blackarm. The grower will, notwithstanding these, stand to benefit to the extent of Rs. 8 per acre by growing it even when an allowance is made for the inferior quality. Attempts are on foot to evolve substrains resistant to blackarm.

9. Eleven strains were compared with CO.2 and 920 on the Cotton Breeding Station. Only one substrain from X 4383 excelled them in yield. Three karunganni strains were also tested with Cambodia strains under restricted irrigation. None were near CO.2, showing thereby that karungannies could not compete with Cambodia cottons grown on red soil under irrigated conditions. This was also confirmed by a trial conducted in the district.

10. Studies of nine hundred and twenty-four cultures grown in the progeny rows revealed that progenies of crosses between the new strains X 3915 and X 4383 contained more promising biotypes than those met with in the multiple crosses. It was found that in the latter group, the stability of combination of characters was low. One important result of the extensive studies on hybrid cultures has been the shifting of the minimum for the comparison of lint length. All plants and cultures with halo lengths lower than twenty-eight millimeters are now rejected irrespective of their possessing desirable characters in other directions.

11. One hundred and fourteen American varieties were imported for trial. All of them were jassid susceptible and unsuited to Coimbatore conditions. It was gratifying to note that a few of them were much earlier, longer linted and bigger bodied. These were crossed with the standard Cambodia cotton strains.

12. (b) *Improvement of "Salems"*.—Strains evolved in the Madras *herbaceum* scheme were again tested for yield with the standard strain K1 at eleven centres, in Coimbatore, Ramnad and Tinnevely districts. None of them proved superior to K1. It might be mentioned here that many of these strains were observed to be uniformly better than K1 in the yield trials conducted over more than four seasons on the Cotton Breeding Station, but when they were tested in the districts on ryots' fields, their response was not as consistently good as that of K1. This would mean that these strains are place bound.

13. Sixty cultures were tested in replicated progeny rows. Six were better than K1. It was noted that progenies of 1523 × 52 contained a large number of cultures combining lint lengths more than thirty millimeters, ginnig percentage over thirty-one and yields more than K1. These should be considered as a fortunate find, since they would form the starting points for the evolution of strains in country cottons with one and one-eighth inch lint length as against the types with only seven-eighth to one inch met with normally all over India.

14. A matter of greater importance was the production of a new species of tetraploid cotton by Sri N. Kesava Ayyangar by the application of colchicine to cotton seedlings. A twenty-six chromosomed partially sterile F1 of karunganni and a wild African cotton (*G. anomalum*) was converted by a bud mutation into a fifty-two chromosomed fully fertile plant. It has the lint length of the karunganni parent and the fineness of *anomalum* and its progenies are breeding true to these characters. Its highly welcome feature is its crossability with all cultivated American species. Its hybrids are under study. It is hoped this new species being a derivative from the black soil grown karunganni cotton, will remove the present disability of the Cambodia cottons of not thriving well on rainfed black cotton soils.

15. (c) *Agronomic and other studies*.—Seeds of K1 were obtained from different centres including those from Tinnevely district and tested again with those produced on the Cotton Breeding Station with the object of verifying the farmers' opinion of the superiority of karunganni seeds imported from Tinnevely district. The trials once again showed that the claim made in favour of the imported seeds was only imaginary. It was also observed in another set of trials that the greater drought resistant character attributed to the mixtures of karunganni and uppam cottons, called commercially as "Tinnies," was not true. The trials consisted of local mixtures available in the bazaar and of mixtures made artificially in different proportions with karunganni, uppam and also with two other strains. It can be said conclusively from the information so far obtained in the present as well as in previous years that the sowing of either pure uppam or a mixture of uppam and karunganni is less remunerative than the growing of pure karunganni, and that the popularity of the mixture is due to the appearance given by a few highly

bearing hybrid plants present in such mixtures and to the character of setting bolls simultaneously manifested by uppam. Another point of interest is that in a mixture, the survival value of uppam is greater than karunganni with the result in a field growing the mixture, uppam plants are more frequently seen.

16. The manurial trial that was conducted during the year pointed that application of ammonium sulphate in 1½ her doses than one cwt., was not of much benefit to karunganni cotton.

17. Improvement of cotton yields by electrocultural treatments was tried again but no beneficial effect was noticed.

18. Studies on the mode of inheritance of filament colour, leaf curliness, floral anatomy and lintlessness were continued. In the first three, definite indications of their factorial constitution were obtained. Evolution of new cotton species by colchicine treatment was again studied. Two occasionally setting hexaploids were produced from a completely sterile triploid. Their breeding behaviour has yet to be studied.

19. The distribution of insects in the wild cottons was studied weekly and the data confirmed the deductions made last year. *G. trilobum* continued to be completely resistant to boll worms, though highly susceptible to other cotton pests and diseases.

20. *Other crops*.—Redgram suffered from drought in the early stages and from wilt in the later stages of growth. Out of one hundred and forty cultures grown in progeny rows, only four surpassed the control. In the yield tests five strains proved superior to the local mixture. The wilt resistant strain from Pusa was too late for Coimbatore.

21. Bengalgram was damaged badly by the gram caterpillar. None of the thirteen strains tested for yield were better than the control strain 468; 2,400 lb. seeds of strains 482 and 468 were distributed to the cultivators.

22. Amongst the three varieties of berseem got for trial, only that obtained from North-West Frontier Province gave two cuttings and the other two dried up after the first.

SCHEMES FINANCED BY THE INDIAN CENTRAL COTTON COMMITTEE, BOMBAY.

The following four schemes were run during the year under report.

23. (a) *Madras pempheres scheme*.—This was started in 1931 with the object of devising measures for the control of the cotton stem weevil (*pempheres affinis*). It had three wings—botanical, biochemical and entomological. The entomological wing was closed on the 31st October 1938, while work in the bio-chemical side was terminated on the 31st August 1939. The botanical part alone was under study throughout the year. Two generations—one at Srivilliputtur and another at Coimbatore—were raised as in the last

three years. Plant mortality was poor (up to twenty per cent) at the former centre, while it was unprecedentedly high (up to ninety per cent) at the latter locality. Such a condition was useful in distinguishing the really resistant cultures from the pseudo-resistant. As a matter of fact all the cultures which were deemed resistant on account of their recording mortality below five per cent in the previous years were found to exhibit fairly high mortality during the year. But in the case of their resistance to adult emergence, they kept up to their previous behaviour, suggesting thereby that the conditions leading to the causation of these two phenomena were not identical. These observations indicated that high hopes given last year about the possibilities of evolution of resistant strains in the near future would not prove true. Periodical examination of one of the resistant strains and CO.2 for *pempheres* infestation, showed that the two strains were equal with regard to intensity of infestation, but the former was markedly superior to CO.2 even from the earlier stages in the rapidity of production of wound gum, in fewness of emergence holes on the stem, and in low mortality. Amongst the nine hundred and thirty-eight cultures tested in progeny rows, only three had yield and resistance, the derivatives from Moco variety being most resistant once again.

24. Forty-eight cultures were compared for yield as well as for resistance to the weevil in bigger plots, at Srivilliputtur and Coimbatore. Ten were distinctly better than CO.2 for yield, but only two were tolerably good with regard to adult emergence and only one had comparatively low mortality combining with good yield and low adult emergence. As these cultures were late in duration, they were crossed with early strains, and selections were made for the combinations, earliness, insect resistance and yield.

25. Studies on the emergence of adults showed that males were more affected by adverse conditions during pupal period, and that mere collection and immediate destruction of dead stems would be useful to control to a great extent the rate of multiplication of the insects. Parasite emergence was high in September; but their availability could not be utilized to the maximum extent due to the shortage of host insects.

26. In the two months when the bio-chemical wing was at work, the studies on the possibility of β amylase component to give suitable criteria of resistance were continued. Two links in the chain of evidence were obtained. One was that Cambodia parent contained during its resistant phase high amounts of β amylase component and the other was that bulk Cambodia round about Coimbatore showed high polysaccharide content in places where it proved resistant to *pempheres*.

27. *Madras Nadam Breeding Scheme* was in the seventh year of its run. It was started with the object of evolving annual strains to replace the perennial nadam strains grown in parts of Coimbatore, Trichinopoly and Salem districts. The experimental cultures were grown on 5.5 acres leased for the purpose. The annual rainfall,

though more than the average, was not helpful to crop growth due to unfavourable distribution. The plants were stunted and badly damaged by stem weevil and boll worms. The exotic types suffered more in the early season, but finally the annual indigenous types had the highest mortality. Statistical analyses of yields revealed that the exotics though inherently superior to the indigenous, were not as constant in their behaviour as the latter. Strains X 3915 amongst the Americans and K1, 6145, 6144 and 4714 amongst the Asiatics were the best. It has to be determined whether they can be raised as mixtures with cereals, and whether their yield will compensate for the extra cultivation involved in growing them annually.

28. In another series of trials it was sought to find out whether the nadam could be supplanted by better varieties of perennial cottons. None of them were distinctly better than nadam in their yields of the first year. They are kept on to secure their yields during the second year. K1 that was grown along with them yielded two and a half times more than local nadam.

29. *Madras Mungari Cotton Scheme* was worked for the third year with the object of evolving medium stapled strains to replace the short stapled and high ginning mungari cottons raised on the red and mixed soils of the Ceded districts. 7.77 acres were leased near Adoni in two blocks to represent the red and light black soils of the tract. The season was normal. Ten strains consisting of four Americans and six Asiatics including H.1 of the 'Westerns' tract were compared for yield with the local mungari on both blocks. None of them were distinctly superior to the control. Strains V 434 and 6042 were equally good on both soils, while X 4383 was better on mixed soils. H1 was the poorest on both soils. Trials with five strains were arranged at eight centres in the districts. But due to erratic rainfall four were not sown. One was abandoned on account of insect damage. In the remaining three, strain V 434 was equal to the control. Strain X 4383 was statistically inferior at two centres. But it was reported to have done well in the observation plots arranged in Kurnool district. It would appear from the studies made during the past three seasons that strains X 4383 and V 434 would prove good strains to replace the mungari cottons. Three hundred and forty-five cultures were tested in progeny rows, of which only nine were superior to the control in yield.

30. *Madras-Cocanadas Breeding Scheme* was sanctioned by the Indian Central Cotton Committee for improving the "Cocanadas" cotton in yield, ginning percentage and colour. It was started on 1st February 1940 when an officer was appointed to conduct a botanical survey of the tract. Many of the villages growing this cotton in Guntur, Kistna and Nellore districts were visited by him during the period from February to May, for the study of plant variability and collection of material suitable for breeding. It has been noted by him that cottons are being grown on soils ranging from poor, shallow, red gravelly to deep black, soils and that on the

poorest soils as in Podili and Darsi taluks of Nellore district, and on deep black soils as in Palnad taluk of Guntur district, cotton is sown pure while on red loamy and light black soils, cotton is raised as a mixture with cereals and groundnut. Since hand-ginning and hand weaving are more common in these parts there is not much scope for intermixing of varieties except in eastern taluks. It is further observed that all highly coloured cottons are short stapled and that types combining all desirable characters are few in number. The collected material was examined in the laboratory and was sown partly at Guntur agricultural research station to evolve types suited to black soils and partly at Narasaraopet to suit the requirements of the red and light black soils.

31. *Miscellaneous.*—The Indian Central Cotton Committee, Bombay, held, at the request of the Madras Government its forty-first sessions at Coimbatore and all the members took that opportunity to visit the Cotton Breeding Station. The nature of work done on the station was explained to them with the aid of field plots, charts and exhibits.

32. I attended as a member, two meetings of the Indian Central Cotton Committee, Bombay, nine meetings of the cotton purchase committee of the Central Jail, Coimbatore, and a number of meetings of the Research Council and Station Reports Scrutiny Committee. I visited Nandyal and Guntur stations in connexion with the review of experiments conducted on them up to now.

33. The section took part in the exhibitions held at Madras and in the Research Institute in connexion with the College Day.

34. I examined 365 samples of plant, kapas and seeds of "puli-chai" sent by the Special Agricultural Demonstrator and certified to their containing *roseum* or otherwise.

COIMBATORE,
2nd August 1940.

V. RAMANATHAN,
Cotton Specialist.

ADMINISTRATION REPORT OF THE MILLETS SPECIALIST AND GENETICIST FOR THE YEAR 1939-40 (FASLI 1349).

I submit herewith my Administration Report for the year ending June 1940.

2. *Charge.*—I was in charge of the office of the Millets Specialist and Geneticist and of the Millets Breeding Station throughout the year. As Geneticist, I was in charge of the Botany sub-section also.

3. *Tours.*—I was on tour for 41 days in the year visiting centres of millet work and establishing contacts with the district officers. The assistants were out for 120 days and the fieldmen for 152 days, mostly on work connected with observation and trial plots in the districts.

4. *Genetics—Teaching.*—Thirteen lectures were delivered to Class III B.Sc. Ag., on Genetics and Plant Breeding. These were supplemented by field classes at the Paddy, Millets, Cotton and Sugarcane Breeding Stations. There were special classes on Oil Seeds and Bananas. For this wide touch on the practical aspects of genetics and plant breeding, I am indebted to the help and co-operation of the officers at Coimbatore. *Publications.*—Nine articles on the genetics mostly of sorghum were published during the year. These appeared in the Madras Agricultural Journal, the Madras University Journal, Current Science and the Proceedings of the Indian Academy of Sciences, Bangalore. *International Congress.*—Ten enlarged photographs and two paintings illustrative of special aspects of genetics in millets were sent to the International Congress of Genetics, Edinburgh, on the request of J. H. Martin of the Bureau of Plant Industry, United States of America.

5. *Millets work at out-stations.*—The work of the Millets Assistants posted to Research Stations in the Bellary, Kurnool, Guntur, Vizagapatam, South Arcot and Tinnevely areas, will be found in the reports of the Circle Officers in charge of the respective stations.

6. *Cholam (Jonna: Telugu).*—At the Millets Breeding Station 1,104 units of cholam were sown. *Economic work—Yield trials.* Main season, 1939. *Periamanjil cholam.* 7 strains, A.S. 29, A.S. 1098, A.S. 3508, A.S. 3518, A.S. 3566, A.S. 3596 and A.S. 3597 were compared with the local seed. All the seven strains gave significantly higher yield of grain than the local seed. Between the strains the differences were not significant. *Talaivirichan cholam.* 7 strains, A.S. 1055, A.S. 1093, A.S. 3313, A.S. 4279, A.S. 4283, A.S. 4288 and A.S. 4290 were compared with the local seed. All the 7 strains gave significantly higher yield of grain than the local seed. In preliminary yield trials, 8 selections of Periamanjil cholam alternated with the standard A.S. 29 and 18 selections in Talaivirichan cholam with the standard A.S. 1093. In the former,

none of the selections proved better than the standard and in the latter 4 were better and taken for further tests. *Summer season, 1940.* As the water level in the wells went down, only a limited crop of irrigated cholam could be sown. It consisted only of new seeds, varieties and types for revival of seed and plant material, and of artificial crosses and their progeny.

Crosses for yield.—From the F_2 generation of the crosses and backcrosses between Periamanjol cholam and the African sorghums *S. caudatum* and *S. caffrorum*, having big earheads and bold grain, selfed seed from 14 selections with Periamanjol affinities was carried forward for further selection.

Fodder improvement.—The local Periamanjol cholam is pithy stalked. With a view to improve its fodder quality it was crossed with A.S. 3355, the good fodder cholam strain of the station, which is juicy stalked with a heavy tonnage of green fodder. A.S. 3355 has, however, the disability of long duration and less seed from which A.S. 29 does not suffer. This cross has been made with a view to evolve a strain combining the good qualities of both. Out of 16 selections of Periamanjol cholam with juicy stalk, obtained from the cross with the Bellary Tella Jonna, the five best have been carried forward for yield tests with the Periamanjol cholam strain A.S. 29. Talaivirichan cholam is of poor fodder value. A juicy stalked Talaivirichan cholam isolated from a cross with the Bellary Tella Jonna was crossed again with the Talaivirichan cholam strain A.S. 1093 to tone up yield. From this cross three hybrids have been carried forward for raising the second generation.

Striga resistance.—Ten selections consisting of Periamanjol cholam (A.S. 29), Bonganhilo (A.S. 4003), Bilichigan (A.S. 4693), 4 hybrids from crosses between Periamanjol cholam X Bonganhilo, and Periamanjol cholam X Bilichigan, and 3 backcrosses from the above were sown in the striga infected plot. From the F_2 and backcrosses 8 selections with Periamanjol affinities and resistant to striga were carried forward. These will be tested for striga resistance, purity and yield, and the promising ones will be compared for yield with the standard, A.S. 29. Resistance to striga attack appears to be a dominant character.

Yellow leaf disease.—Facilities for the study of this disease were provided to the Entomologist. At his suggestion a 10 link belt all round a 7 acre cholam crop was sown with the legumes *Crotalaria juncea* and *Sesbania sp.* The effect of belts on the incidence of this disease on cholam was pursued by him. He notes that the two border crops have not been helpful owing to their retarded growth. It is proposed to try other crops. Talaivirichan cholam, having been found to be comparatively less susceptible to attack, is being grown at the station in borders adjacent to bunds of experimental plots.

Cholam malt.—Seeds of 6 fresh varieties were supplied to the Agricultural Chemist for testing. This brings the total number

of varieties grown for this purpose since 1934, to 57. Of these 19 are from Madras, 15 from the other Provinces of India, 17 from Africa and 6 from America.

7. Cholam—District trials.—Strains are usually introduced in likely centres, first in observation plots. When such plots indicate the suitability of the strain to the place, then replicated trials are conducted in one or more centres before further distribution. *Rain-fed cholam.*—In Periamanjol cholam, A.S. 29 was compared with the local seed in the Pollachi taluk and proved better than the same. In the Palladam area owing to the late sowings and heavy rains on the young crop, the yields were poor and the results were conflicting. In many cases there was an increase in fodder yield over the local seed, showing that the growth was good, but the grain setting was poor. As the season was abnormal the tests are being repeated this year. In the Tirupattur taluk of the North Arcot district, it did well in observation plots. In Talaivirichan cholam, which occupies the slopes near the hills round about Coimbatore, 3 strains A.S. 1055, A.S. 1093 and A.S. 4283 were tried in 2 centres in both of which the strain A.S. 1093 gave higher yields than the local seed. A.S. 1093 has done well for a number of years on the Station and will thus be the improved strain in the Talaivirichan variety for this tract. The Talaivirichan is the variety of cholam in the Chittoor-Tirupattur area also and here, there is no centre for seed selection work. Trials of Coimbatore strains in this area gave conflicting results in the past. Local seed has been gathered extensively from this area and this is under selection and comparison at Coimbatore. *Irrigated cholam—Red grains.*—In Sen cholam A.S. 389 was sown in 7 demonstration plots in the Musiri taluk (Trichinopoly district) in which it was reported to have yielded 25 to 50 per cent more grain than the local seed. In the Kulittalai taluk (Trichinopoly district) it was sown in 2 replicated trials in both of which it gave significantly higher yield of grain. In the Tiruchengode taluk (Salem district) 2 red cholam strains A.S. 389 and A.S. 841 were raised in observation plots in 2 centres, in both of which, the strains are reported to be suitable and promising. *Yellow grains.*—In the Chinnamanjal cholam 2 strains A.S. 809 and A.S. 3827 were sown in trial plots in 3 centres in the Coimbatore taluk. In all the trials the strains gave significantly higher yields of grain and straw than the local seed. *White grains.*—In the Coimbatore taluk the irrigated strain A.S. 1543 was tried in three centres. In one centre it gave significantly higher yield than the local, while it was equal in the other two. In Bhavani the two strains A.S. 732 and A.S. 1543 were tried in observation plots and A.S. 732 has been reported to merit a replicated trial. In the Pollachi taluk, 4 strains A.S. 732, A.S. 1543, A.S. 1575 and A.S. 2095 were sown in observation plots. In these A.S. 1575 and A.S. 2095 were contemporary to the local variety and are under replicated trials. In the Gobichettipalayam taluk A.S. 2095 did not confirm its previous year's superiority over the local. A large local collection of earheads has therefore

been made for selection. In the Palni taluk (Madura district) 4 strains A.S. 732, A.S. 1543, A.S. 1575 and A.S. 2095 were tried in observation plots under irrigated and rain-fed conditions. A.S. 2095 is reported to be suitable as an irrigated crop and A.S. 1543 as a rain-fed crop. In the Madanapalle taluk (Chittoor district) A.S. 1543 was compared with the local Tella Jonna in a replicated trial in which the difference in yield was not significant. In all cases wherever the strain impressed the cultivators, they preserved the seed for multiplication and supply to neighbours. A.S. 2095 the successful white Chitrai Cholan strain has proved its worth in the neighbourhood. A single landlord purchased 1,000 lb. of seed of this strain in 1938. He preserved seed from the crop raised and grew a 50 acre block in the Vedapatti village in 1940. Another ryot took over 1000 lb. in 1939. It is very likely that less opulent neighbours will draw their small seed requirements from these sources.

8. *Cholan—Scientific work.*—The world wide collection of sorghums have been grouped and studied intensively. Each group has been boiled down to typical representatives. A comprehensive knowledge concerning them has been obtained and a series of articles on the sorghums of the world is under preparation.

It has been recorded that the leaves of sorghum show, especially in mass effect of both seedlings and adult plants, 3 grades in the depth of green, viz., dark green, green and light green. The first and second groups have been found to contain about 20 per cent more of chlorophyll *a* than in the others. In the light green there is more of chlorophyll *a* than in the others. Similarly in the dark green and green there is more of chlorophyll *b*.

Measurements taken of leaf and glume sizes in typical sorghum varieties show that there is a distinct positive correlation between the length/breadth ratio of the leaf and that of the glume, indicating that a narrow glume was associated with a long narrow leaf and a broad one with a broad leaf.

All aspects of the phenomenon resulting in multiple seededness have been examined. It is found that multipleness is the conjoint effect of the extra-fertility in the axil of the lower lemma and the connate condition of one or both of these grains. Extra-fertility by itself, is a monogenic dominant. Connateness is by itself a monogenic recessive to singleness. When extra-fertile and connate types were crossed, the F_1 was extra-fertile only. In the F_2 there was a di-hybrid ratio of extra-fertile, multiple seeded, normal single seeded and connate. The F_3 confirms the genic explanation of multiple seededness.

The structure of the seed coat of sorghum was examined microscopically in a number of wild and cultivated sorghums. A knowledge of this structure has helped in the interpretation of some

Mendelian experiences in the inheritance of grain colour. It has also been noticed that from the wild to the most advanced of the cultivated sorghums, there is a marked increase in the size of the aleurone cells.

Studies in the inheritance of other characters in sorghum are in full swing. The material is vast and much fresh knowledge is being gathered. The cholam research at Coimbatore is, in the words of the Year Book of the United States Department of Agriculture, the most extensive and comprehensive.

* 9. *Cumbu (Sajja : Telugu).*—Three hundred and forty-one units were sown. *Yield trials*—In the rain-fed crop 1939, five strains P.T. 17, P.T. 367, P.T. 504, P.T. 720 and P.T. 724 were compared with the standard P.T. 248, the local *cumbu*. In grain yield, P.T. 367, gave an increased yield of 11.17 per cent over the standard. P.T. 17, P.T. 724 and P.T. 504 were equal to the standard, while P.T. 720, a selection from Pal-adam *cumbu* (Trichinopoly) yielded less than the standard. In straw yield P.T. 17 and P.T. 720 gave higher yields than the standard. Owing to water scarcity in the wells only a limited irrigated crop was sown. It could not, therefore, include yield trials. Nineteen selections from the Coimbatore district, 10 from Salem and 7 from Chittoor were under preliminary yield trials. Of these 4 selections (all from the Coimbatore district) yielded more than the control P.T. 248 and await further tests. It was observed that though Salem is adjacent to Coimbatore, Salem varieties of *cumbu* did not fare well here.

The variety of *cumbu* known as the Australian hybrid in parts of North Arcot district, was tried for the first time at the station in small plots both as an irrigated and rain-fed crop. It had long heads intermediate in length between the "Whip" *cumbu* and the Jamnagar Giant. The emergence of the earhead was rather poor and the grain setting at the basal portion of the head was defective. It looked promising in both seasons and further trials will show how constant it can be.

The varietal survey which was commenced last year was completed. Three taluks in Coimbatore and 7 in Salem were visited. Sixty-two samples of local varieties were collected.

Seed multiplication.—The chief source of growing seed for multiplication, viz., the Central Farm could not cope with it due to water scarcity. To meet the great demand for the seed of P.T. 700, arrangements were made with the Hon'ble Sri V. C. Vellingiri Gounder to multiply the seed in his fields. The crop was rogued by the departmental staff and the required seed was purchased for distribution.

10. *Cumbu—District trials.*—Forty-seven trials were conducted with *cumbu* strains in the districts of Coimbatore, Salem, Trichinopoly, North Arcot and Chittoor, both as irrigated and dry crops.

In the Coimbatore district as an irrigated crop, strain P.T. 700 ("Whip" cumbu) was tried in seven taluks and in 13 centres, in 10 of which it gave higher yields than the local seed. In three taluks it was raised in observation plots and found promising. P.T. 499 (a strain from Punjab cumbu) was tried in two centres in Erode taluk. In one centre it gave an increased yield while in the other it was equal to the local seed. P.T. 2229 (a strain from Kottapuli cumbu) was tried in two centres in Coimbatore and two centres in Gobichettipalayam in both of which it was found to be equal to the local seed. As a rain-fed crop, P.T. 700 was tried in the three taluks of Bhavani, Erode and Gobichettipalayam. In Bhavani and Erode it gave increased yields over the local seed, while in Gobichettipalayam it was equal to it. P.T. 367 (a strain from Bombay bajri) and P.T. 248 (a strain from Coimbatore Kattu cumbu) were also tried in these three taluks. They gave higher yields than the local seed in Bhavani, and were equal to it in the other taluks. P.T. 504 (a strain from Sajja, Cuddapah) was only equal to the local seed in the places tried and will therefore be dropped out for further trials. In the Salem district, trials with cumbu strains were conducted in seven taluks in ten centres as irrigated crops. P.T. 700 gave higher yields in five taluks and was equal to the local seed in two taluks. P.T. 499 was tried in the Omalur taluk and gave higher yield than the local seed in two centres. In the Salem and Rasipuram taluks P.T. 700 was tried in observation plots and appears promising. In the Trichinopoly district P.T. 700 and P.T. 499 were compared with the local seed in which they gave increased yields over it. In the North Arcot district these two strains and P.T. 2229 were tried in five centres of three taluks in observation plots. At Arni P.T. 700 and P.T. 499 appeared suitable for the tract, while at Gudiyattam and Arkonam where P.T. 700 and P.T. 2229 were tried, the crops failed due to water scarcity. In the Chittoor district P.T. 700 was raised in observation plots in the taluks of Chittoor and Palmaner. In the former it appeared as good as the local seed, while in the latter it was found to be much better.

11. *Ragi*.—One thousand and seventy-eight units were sown. *Yield trials*.—In the main season (1939) there were two series of comparative trials for yield. In the first series three selections E.C. 3092, E.C. 3517 and E.C. 3735 were compared with E.C. 593. E.C. 593 remained unexcelled. In the second series (110 days) 3 selections—E.C. 3858, E.C. 3859 and E.C. 3863 were compared with E.C. 3517 as standard. E.C. 3858 and E.C. 3863 were found to be superior to the standard. In the summer season (1940), there were 2 series of yield trials. In the first series (105 days) 3 selections E.C. 3845, E.C. 3854 and E.C. 3868 were compared with E.C. 1507 as standard and in the second series (110 days) 4 selections E.C. 3858, E.C. 3863, E.C. 4015 and E.C. 4154 were compared with E.C. 3517 as standard. In both the trials there were no significant differences in yield. It is interesting to note that the same 2 strains E.C. 3858 and E.C. 3863 were better than

the same standard E.C. 3517 in the main season and only equal to it in the summer season. Thirty fresh economic selections were under preliminary yield trials. Of these two have been carried forward for replicated tests.

With a view to evolve high yielding short duration strains crosses were made between E.C. 3640, a purple selection with incurved heads and a duration of 90 days and the 2 strains E.C. 593 (120 days) and E.C. 3517 (110 days). Four F_1 plants were raised. These were only 95 days in duration. The F_1 plants were carried forward to raise the F_2 generation in the coming season and from this suitable selections will be taken.

E.C. 1540 is a white ragi evolved from crosses made at the Millets Breeding Station. Analysis made at the Indian Institute of Science, Bangalore, shows that this ragi has a very high protein content. Tests conducted at the Nutrition Research Laboratories, Coonoor, show that this was phenomenally rich in vitamin content. But this ragi is a poor yielder under Coimbatore conditions. To introduce the good qualities of E.C. 1540 into the current high yielding strains and thus enrich the diet, crosses were made between this and E.C. 593, E.C. 3517, E.C. 3735, E.C. 24 and E.C. 2985. E.C. 1540 was supplied to the Agricultural Chemist for malt tests and it has been reported by him to have proved satisfactory. A small quantity of this valuable seed has also been supplied to the Mysore Department of Agriculture.

12. *Ragi—District trials*.—E.C. 593 continued to be popular in the districts. Five thousand eight hundred and sixty-three pounds of seed of this strain have been distributed this year from the Central Station. In certain areas of Salem, Chittoor and Vizagapatam districts, it has earned a good name as a rain-fed crop also. In areas where shorter duration varieties are grown, E.C. 593 has not been well received owing to its longer duration (120 days), though often this duration is well compensated by the heaviness of its yield. With a view to provide suitable short duration strains, 2 strains E.C. 3517 and E.C. 3735 (110 days) were given out for trial in the districts of Coimbatore, Salem, Trichinopoly, Chingleput and Chittoor, on the results of preliminary observation plots. In the Coimbatore district E.C. 3517 was tried in the Pollachi taluk and the increase in the yield of the strain over the local seed was not significant. In the Trichinopoly district the same strains were tried in Karur where they gave increased yields over the local seed and these were significant. In the Salem taluk the strains yielded as much as the local ragi, even though 10 days earlier than the local variety. In the Chingleput district the 2 strains were tried in the 3 taluks of Sriperumbudur, Conjeeveram and Chingleput. In the 2 latter taluks significant increases in yield were obtained. In the Palmaner taluk of the Chittoor district the strains yielded less than the local seed. These tests are educative in meeting seed demands. In addition

to the above replicated trials, these strains were raised in observation plots in 26 centres in the districts of Nellore, Chittoor, Chingleput, North Arcot, Tanjore and Trichinopoly, as first introductions to judge their suitability to these areas. Based on these observations these strains are on replicated trial in 7 centres now.

13. *Tenai* (Korra : Telugu).—Three hundred and thirty-six units were sown. *Yield trials*.—In the main season there were 2 series of yield trials. The first series was a repetition of the last year's trial which failed for want of timely rains. Five strains were compared with S.I. 523 as standard. There were no significant differences in yield between them. The second series consisted of 4 selections which were compared with the same standard. The standard remained unexcelled. One hundred and six selections from other local varieties were under preliminary comparative trials. Of these 8 have been chosen for yield tests next year.

Since S.I. 523 has not been excelled on the station and with a view to a wider choice of seed material to suit varying conditions in the districts, a wide collection was made. One thousand and ninety-four single plant selections were made from crops in ryots' fields from 7 taluks in the Coimbatore district, selections from which will provide a wider range of suitable strains.

District trials.—Strain S.I. 523 which has been outstandingly good at the station was tried in 3 taluks of the Coimbatore district, viz., Palladam, Coimbatore and Pollachi. In all the 3 centres the strain gave increased yields over the local seed; but the increases were significant only at the Palladam centre. This is the first year of trial and tests will have to be repeated.

14. *Cowpea* (*Vigna unguiculata*, Walp.).—Four hundred and ninety-nine units of this pulse were sown. There were 2 series of yield trials, one for grain and the other for foliage. In the grain series 4 selections C. 92, C. 100, C. 498 and C. 521 were compared with C. 57 as standard. C. 521, a selection from the variety "Kunde Winia," Tanganyika, was found to be significantly superior to the rest having given a considerable increased yield over the standard. In the series for foliage 3 strains C. 37, C. 42 and C. 422 were compared with the standard C. 57. C. 422, a selection from the local variety gave the largest cut, the increase over the standard being very high. Six selections for grain, 11 for foliage, 5 for pods and 15 for peas, were in preliminary yield trials and from these suitable selections have been carried forward for further trials.

The anthesis in this pulse was studied. Anther dehiscence may take place from 9 p.m. to midnight inside the mature unopened flower. The time of dehiscence is affected by moonlight, its influence being to make dehiscence earlier. Bright moonlight is more effective than when the sky is clouded. The flowers open between 5 and 9 a.m. in the next morning, the flush of opening being between 6 and 8 a.m.

15. *Garden beans* (*Dolichos lablab*—Avarai : Tamil, Chikkudu : Telugu).—Out of the 120 varieties of this valuable bean, the 10 best varieties of last year were sown along with a second batch of 40 varieties. From this batch also the 10 best have been picked. The third batch of 40 awaits sowing.

16. *Red gram*.—As part of the scheme to increase revenue from the Research Station, red gram was sown in an area of 5.10 acres. It yielded 4,125 lb. of grain, which together with the stalks was sold for Rs. 213.

17. *Berseem* (*Trifolium Alexandrinum*).—Two varieties of Berseem, one from the North West Frontier Province and the other from Egypt were tried during the year. The seed was treated with bacterial inoculum before sowing. The North West Frontier Province Berseem was sown in July. To begin with, the stand of the crop was uniform. A first cutting of 633 lb. in 5 cents was obtained at the end of September and a second cutting of 405 lb. at the end of October. In December a third cutting of 140 lb. was available. At the end of January a fourth cutting of 14 lb. was obtained. After the first cutting the plot began to get patchy with the death of clumps here and there, and this gappiness increased with the cuttings. The Egyptian Berseem was received late and sown only in October. The germination was poor, the plot gappy and the yield poor. Seed setting was unsatisfactory in both the varieties and even if the crop is a success its seed supply will present practical difficulties. The future of Berseem relatively to Lucerne is not bright. Lucerne stands in the field for at least 3 years and yields much more heavily than Berseem. Moreover Lucerne is richer in protein. As a mixture with cereal roughage Lucerne will easily prove superior to Berseem.

18. *X-ray treatment of millet seeds*.—Cholam, cumbu and ragi seeds were treated with X-rays through the courtesy of Sir C. V. Raman at the Indian Institute of Science, Bangalore. The first generation plants have been raised. It is hoped that in subsequent generations desirable economic selections could be spotted out.

19. *Electroculture experiments*.—The experiments initiated last year on cumbu and tenai were continued. For a second time there were no significant differences between any of the treatments and the control, either in cumbu or tenai. There were also no significant differences between the yields of the various plots in the bulk cholam strain sown over the treated and untreated previous crops.

20. *Seed distribution*.—From the Millets Breeding Station, the following seeds were distributed during the year. Cholam strains, irrigated and rain-fed—27,537 lb., ragi—8,175 lb., cumbu—1,746 lb. —Tenai 156 lb. a total distribution of about 38,000 lb. of all millet strains representing the *primary wave* from the central station. This excludes seed supplied from the 6 district stations at which millets assistants are stationed for economic work in local centres. A continual wave of such fresh and improved seed will have to be going from each of the centres of millet work, few as they are.

Such centres will have to be increased in great numbers. Naked seeds, uncertain weather, and the difficulty of storage are some of the drags on any large-scale seed-farm activities. Moreover, the varieties are very many and much delimited in distribution. The economic backing and outlook of the average millet farmer is poor. Under these circumstances, seed storage and seed preservation could at best be on a cottage basis and at most on a hamlet basis. When once improved varieties have been introduced, their *natural spread* will be fairly rapid, though imperceptible.

Samples of seed of millets and pulses were sent on request to Belgian Congo, Nigeria, Australia, Batavia, Jamaica, London, Port Blair, Assam and Calcutta.

21. *Poultry feed*.—Millet seeds are in demand as poultry feed. Three thousand and five hundred lb. of mixed millets were supplied to the Central Farm for this purpose.

22. *Fodder crops*.—In connexion with a reference with regard to the impetus to be given to fodder production, consequent on Dr. Wright's report, all the available data on fodder crops was gathered from the Agricultural Research Station Reports and a summary submitted to you. A full article on "The Fodder Crops of the Madras Presidency—A Review" was published in the Madras Agricultural Journal for January and February 1940.

As convener of the Fodder Rotations Committee, I attended 3 meetings and wrote up the final report.

23. *Imperial Council of Agricultural Research*.—As a member of the Research Co-ordination Committees for Jowar (chulam) and Pulses, I prepared notes on various aspects of work on them and attended the Committee meetings at Delhi and Simla. I was invited to attend the Fodder and Botany Committees also. As a result of the Jowar Committee meeting I was appointed Chairman of a small sub-committee to undertake the working out of a schedule for the description of Jowar (chulam) varieties.

24. *Indian Central Cotton Committee—Cold Weather Meeting—Coimbatore*.—I was a member of the reception committee. I was invited to be a member of the Agricultural Research Sub-Committee.

A booklet on the work of the Agricultural College and Research Institute, Coimbatore, was got ready for the use of the members of the Committee. I edited this booklet.

25. *Indian Science Congress*.—I attended the Madras Session of this Congress in January 1940 and participated in the discussions at the Agricultural section.

26. *Councils and Committees*.—As a member of the Research Council I helped in the scrutiny of the papers received by the Council and attended its 9 sittings and participated in its discussions on subjects referred to its opinion.

I attended the Advisory Committee meeting of the Dry Farming Scheme at Hagari on the 10th and 11th August 1939.

As a member of the sub-committee for the scrutiny of Agricultural Research Station Reports, I examined the reports of 7 stations, and attended 2 meetings of the full committee to pass the final remarks.

As a member of the sub-committee for the review of the past work of Agricultural Research Stations, I, along with the Cotton Specialist and the respective Circle Officers, scrutinized the previous work of the Guntur and Nandyal Stations. The planning of future work awaits the formulation by local officers of specific local problems which could form the subject of fresh experiments on the Station.

With the Deputy Director of Agriculture, Coimbatore, and the Government Mycologist, I served in the Committee to consider about rust resistant wheats for Madras.

Data on millets were supplied to the Marketing Officer for his use in replying to a questionnaire on Crop Planning and Production for the National Planning Committee.

27. *The University*.—On February 17, 1940, I delivered a University Extension Lecture on Genetics and Plant Breeding. I attended a meeting of the University Board of Studies in Agriculture at Madras on July 8, 1939. I was co-opted as a member of the University Extension Board, 1939-40. I attended three meetings of the College Board at Coimbatore.

28. *Exhibition*.—An elaborate exhibition was arranged during the College Day and Conference in July 1939. Exhibits were sent and the staff were on duty at the All-India Swadeshi and Khadi Exhibition at Madras, and at the Cattle and Pony Show at Tirupur. Millet exhibits were sent to the All-India Swadeshi Exhibition at Salem, the Agricultural and Industrial Exhibition at Vuyyur (Kistna district), the Krithigai Deepam festival at Tiruvannamalai, the Sivarathri Exhibition at Kollegal, and the Red Cross Exhibition at Coimbatore. Exhibits of genetic interest were sent to the Professor of Botany, Presidency College, Madras, for the Centenary celebrations. Exhibits were sent to the Industrial and Commercial museums at Salem, Chittoor and Madras, and to the Salem Rural Development touring van.

29. *Visitors*.—The following were some among the many distinguished visitors who paid a visit to the Section. H. M. Hood, I.C.S., Adviser to His Excellency the Governor; P. M. Kareghat, c.I.E., I.C.S., Vice-Chairman, Imperial Council of Agricultural Research; Dr W. Burns, c.I.E., Agricultural Commissioner with the Government of India; the members of the Indian Central Cotton Committee; Sri G. Seshadri Ayyangar, Negapatam, Honorary visitor; Sri T. N. Ramakrishna Reddi, M.L.A., Chittoor; the

Muslim Educational Committee; a batch of students of the Agricultural and Industrial School, Sivaganga; Monseieur Koesnoto, Agricultural Expert, Batavia; and J. Patino Navarattee, of the National Agricultural School, Mexico City.

LECTURING AND SYSTEMATIC BOTANY SUB-SECTION.

As the senior-most Crop Specialist, I continued to be in administrative control of this sub-section. Sri P. S. Jivanna Rao, the permanent Lecturer in Botany, was on leave for 2 months and 13 days in 1939, and again went on long leave for 28 months from the 26th January 1940. Sri S. N. Chandrasekhara Ayyar is officiating as Lecturer. The herbarium with the grass and banana work continued to be in the immediate charge of the Assistant in Systematic Botany, Sri K. Cherian Jacob, except for a period of 1 month and 21 days when he was on leave. Sri T. Venkataramana Reddy, B.Sc. Ag., M.Sc., has taken the place of Sri S. N. Chandrasekhara Ayyar as Assistant in Botany, Sri P. S. Jivanna Rao's leave being sudden and in a college term, teaching work was managed with the help of Sri T. S. Ramakrishnan, M.A., and Dr. N. Krishnaswamy, B.Sc., Ph.D., whose services were kindly spared by the Government Mycologist and the Geneticist. As usual, through the co-operation of the Principal, the Farm Manager in charge of the Orchard and the Botanic Gardens helped in the Horticultural classes.

2. *Teaching*.—The University syllabus was adhered to. For the B.Sc. Ag., III, Mycology was handled by the Mycologist, and Genetics and Cytology by the Geneticist. The classes and lectures handled by the Lecturer in Botany and his assistant are given below :—

B.Sc. (Ag).

			Lectures (one hour).	Practicals.		Total hours.
Class	I	..	52	53 (78 hours)	..	130
"	II	..	56	31 (61 ..)	..	117
"	III	..	42	24 (67 ..)	..	109

Short Courses.

			Classes.		Total hours.
In Farm Management (on plant life, theory and practical combined)	..	..	6	..	12
In Horticulture	..	..	27	..	70

Sri S. N. Chandrasekhara Ayyar who represents the teaching staff of the college in the University Academic Council, attended two meetings of the Council during the year.

3. *Seed testing*.—175 samples of seeds were tested for viability. The bulk of the samples were cotton seeds from the Assistant Director of Agriculture, Coimbatore.

4. *Systematic botany*.—One hundred and eighty specimens consisting of 90 species were collected from the districts of North Arcot, South Arcot and South Kanara. Seven hundred and seventy-seven specimens were poisoned and mounted. One thousand and five specimens were identified. Of these, 485 were grasses identified for the Government Agricultural Chemist in connexion with his study of the mineral contents of South Indian grasses. The identifications were chiefly to the Agriculture, Industries, Forest, Health, Education and Tea Scientific departments, the Chemical Examiner to Government and to the Native States of Pudukottah, Mysore and Indore. Nineteen authenticated specimens were loaned. One hundred and thirty-two specimens of American grasses were received from Dr. E. K. Janaki Ammal. Twenty specimens were spared on request. Sixty-nine specimens were prepared for correspondents.

When I took over the sub-section consequent on the amalgamation of teaching and research, it was noticed that about 8,500 specimens were in various stages of the process of incorporation and needed systematic and quick clearing. Five thousand two hundred specimens that were easy to finish off were dealt with and incorporated during last year. In the year under report 1,500 specimens were incorporated leaving the balance to be finished in the current year.

5. *Economic botany—Intelligence and seed supply*.—Whereas other sections are specializing in certain crops, the herbarium is the only clearing house for general botanical information. Two hundred and sixty-nine subjects pertaining to general and economic botany were dealt with during the year. These covered a wide range of subjects and were from a wide circle of enquiries. Botanical materials were supplied to the College of Agriculture and Botanic Gardens in New York, United States of America. For the National Planning committee full data was supplied on medicinal plants, wild flowers, and trees used for arboriculture in this Presidency. Notes on 40 important Madras medicinal plants and 18 important indigenous fodder grasses were prepared by Sri K. Cherian Jacob for the "Note-book of Agricultural Facts and Figures" under revision. A note on the "Edible Fruits found wild in the Presidency" by Sri K. Cherian Jacob was published in the May 1940 issue of the Madras Agricultural Journal.

6. *Fodder grasses*.—Fifteen economic fodder grasses are being grown in 2½ cent plots. A number of other grasses are under observation in small plots. A seed distribution register was opened during the year. Thirty-two pounds of seeds of 13 kinds of grasses to 12 correspondents have been distributed. These have been mostly to the District Forest Officer, North Coimbatore (formerly Special Grazing Officer). In due course enquiries will be made from all to whom seed was supplied, so that the performance of the grasses may be recorded and be of help in further distribution. A survey was made of the grass flora of the North and South Arcot

districts (along with the banana survey). An article on the " Grass Flora of North and South Arcot districts with special reference to Fodder Grasses " by Sri K. Cherian Jacob was published in the January 1940 issue of the Madras Agricultural Journal. The Assistant in Systematic Botany attended two meetings of the Provincial Standing Fodder and Grazing Committee held at Madras.

7. *Bananas*.—These received as much attention as could be given to them with the pressure of the major work of the section. A separate banana scheme is awaiting sanction for the elaboration of work on this important fruit of the poor people. Along with the survey of fodder grasses a banana survey was made in the districts of North and South Arcot. A new variety was added to the collection. Ten local names were related to the standard nomenclature. The morphology of 15 varieties was studied. Banana ' figs ' and flour were exhibited at five exhibitions held in different parts of the Presidency. A register for the supply of banana suckers was opened during the year. Three hundred and seventy-eight suckers of 50 varieties were supplied to meet 23 demands. In due course, enquiries will be made from all to whom suckers were supplied so that the performance of the varieties may be recorded and be of help in further distribution.

COIMBATORE,
5th August 1940.

G. N. RANGASWAMI AYYANGAR,
Millets Specialist and Geneticist.

ADMINISTRATION REPORT OF THE OIL-SEEDS SPECIALIST FOR THE YEAR 1939-40 (FROM 1st JULY 1939 TO 30th JUNE 1940).

Charge.—I was in charge of the Oil-seeds section throughout the year. The Agricultural (Coconut) Research Stations, Kasaragod, Pilicode, Nileshwar II and III in South Kanara district, and the Agricultural (Groundnut) Research Station, Tindivanam in South Arcot, continued to be under my control.

2. *Staff*.—Messrs. G. Venkatanarayana and C. R. Seshadri continued to act as temporary Superintendents in the Coconut and Groundnut Research Schemes financed by the Imperial Council of Agricultural Research. Assistant, Sri K. Hanumantha Rao, was transferred back to the Paddy section in September 1939 and Sri B. M. Pinto posted in his place.

3. *Tours*.—I was on tour for 67 days during the year under report chiefly for purposes of scrutinizing and directing the various items of research work in progress at the coconut and groundnut stations. I also inspected the groundnut trials at Pollachi, Guntur and Anakapalle. The assistants toured for 84 days in connexion with the layout and harvest of some of the trial plots of oil-seeds in the districts.

4. *Research schemes financed by the Imperial Council of Agricultural Research*.—The five-year scheme of research on groundnuts started on 22nd January 1937 and another one on coconuts inaugurated on 15th September 1938 continued to be worked in the section. Items of research as envisaged in the approved technical programmes were carried out and detailed reports of the work done under the two schemes are submitted separately.

5. *Season*.—The season at the Agricultural Research Station, Tindivanam, was not altogether favourable for rainfed groundnut and castor crops. The partial failure of the south-west monsoon affected the early growth of these crops and more particularly that of the short duration bunch types of groundnuts which gave poor yields in consequence. The prolonged wet and cloudy weather that prevailed in the month of October and early part of November interfered with the setting of capsules in the castor crop while the abrupt ending of the north-east monsoon in the third week of November hindered the proper harvest of the spreading types of groundnuts.

On the West Coast, at the Coconut Research Stations, the rainfall was more or less normal, except for the long spell of dry weather that extended from December to April.

At the Central Farm, Coimbatore, where a field was devoted to oil-seed cropping, conditions were more favourable than in previous years. However, the unusually heavy showers received in October induced rank vegetative growth in castor crop.

6. *Groundnuts*—(i) *Improved strains*.—The demand for seeds of improved varieties of groundnuts, viz., A.H. 25 (*Saloum*), A.H. 32 (*Gudiyattam bunch*) and A.H. 45 (*Hebbal*) continued to be on the increase as in previous years. Arrangements were made to distribute all the available quantities from Tindivanam and other district farms where seed multiplication work has been carried out. It was however possible to meet only a fraction of the total demand.

Some of the improved varieties are also becoming increasingly popular outside Madras Presidency, particularly in Baroda State from where there was an indent for 500 Railway maunds each of A.H. 25 and A.H. 32 seeds.

There is a demand from certain districts for a high yielding strain of groundnuts which gives higher percentage of kernels to pods than A.H. 25. To meet this, three new strains giving 4 per cent more of shelling outturn have been distributed for trials in North Arcot, Chittoor and Salem.

(ii) *Yield trials*.—The determination of the yielding capacities of promising varieties and economic selections formed, as usual, an important item of groundnut work.

(a) *Varieties*.—In the varietal trials, none of the four bunch varieties excelled A.H. 32 (*Gudiyattam bunch*) either in yields or in qualitative characters, while in the spreading, A.H. 3849 (*Gumitam Budda*) collected from Kurnool district gave an increase of nearly 10 per cent over the local.

(b) *Bunch selections*.—Out of six selections that were tried, four gave yields on a par with A.H. 32, the control. Among these, only A.H. 218 and A.H. 1192 came up to the standard of the control in qualitative characters.

(c) *Spreading selections*.—All the twenty selections that were compared with A.H. 25 and the local variety, yielded significantly more than the local, the percentage increase ranging from 12.7 to 49.4. Eleven selections were on a par with A.H. 25, the improved variety, in yields, and also superior to it in shelling and other qualitative characters.

(iii) *Preliminary yield trials of selections*.—Six out of 25 bunch selections yielded only on a par with the control. Out of 20 spreading selections compared with *Local Mauritius*, 9 recorded significant increase in yield.

(iv) *Observations on single plants*.—Out of a total of 1,579 selections from district and foreign varieties and progenies of crosses sown in row tests, 797 yielded over 10 per cent more than the

adjoining controls. Thirty-three selections that appeared promising in last year's row tests were multiplied for seed. On the basis of qualitative characters 23 have been retained for preliminary yield trials.

(v) *New selections*.—A large number of selections were further made from the progenies of crosses for new combinations of economic characters and await study for purity and yields.

(vi) *Hybridization*.—Nineteen crosses for combining economic characters have been newly made. Studies on inheritance of the habit of growth and the multi-kernelled nature of pods were continued in the progenies of crosses made in previous years. In the case of the inheritance of multi-kernelled nature of pods, it is seen that the 1-2 seeded condition is dominant over 1-3 seeded and that the two characters behave as simple allelomorphs. The progenies of cyclic crosses were under observation for isolation of desirable economic types.

(vii) *Study of the effect of climate and soils on groundnuts*.—The second year's trials under this scheme were conducted at thirty agricultural stations in the various Provinces and States in India with the kind co-operation of the respective Governments. To the last year's four spreading pure lines, two more bunch types were added. In thirteen places the selections gave significantly higher yields than the locals. The places at which the season was fairly normal and where the selections have given highest yields with the percentage of increase are given below :—

A.H. 45 (bunch-erect type).		A.H. 218 (bunch type).		A.H. 477 (bunch-spreading type).	
Place.	Percentage increase.	Place.	Percentage increase.	Place.	Percentage increase.
Cuttack	25.0	Buldana	59.8	Babbur	94.6
Krishnagar	22.0	Nawadah	43.6	Dharwar	62.2
Jalgaon	12.4			Nawadah	54.5
				Tindivanam	38.3
				Jalgaon	34.7
				Cuttack	31.6

A.H. 113 (spreading type).		A.H. 186 (spreading type).		A.H. 334 (spreading type).	
Place.	Percentage increase.	Place.	Percentage increase.	Place.	Percentage increase.
Balia	67.7	Jalgaon	51.0	Nawadah	49.9
Nawadah	42.8	Babbur	48.6	Jalgaon	26.2
Jalgaon	32.4	Tindivanam	32.8	Tindivanam	19.2
Rawalpindi	22.0	Nawadah	21.3		
Tindivanam	19.3				
Vesma	12.1				

Yields and other qualitative characters are seen to be greatly influenced by the rainfall and its distribution during the growth-phase of the crop, the nature of the soil and its capacity to retain

moisture coming into prominence only when the rainfall is low, excessive or badly distributed. The ranges in the variation of some of the important qualitative characters noted during this year are given below :—

Pure line.	Shelling percentage.	Number of kernels per pound.	Oil content per cent.
A.H. 45	64.3-77.5	898-1118	46.31-55.95
A.H. 218	67.3-80.1	1014-1414	45.73-54.45
A.H. 477	58.5-78.9	777-1145	41.44-55.70
A.H. 113	60.4-77.6	861-1246	46.24-54.37
A.H. 186	63.3-79.0	793-1313	47.28-54.22
A.H. 334	64.6-77.9	820-1332	44.94-53.96

(viii) *Manurial experiments*.—The manurial experiment on rainfed groundnuts started in 1937 was continued for the third and last season. The treatments as reported last year consisted of the application of N, P, K and their combinations with and without a basal dressing of 3 tons of cattle manure per acre. The doses of concentrates used were $\frac{1}{2}$ cwt. of ammonium sulphate to supply 11 lb. of N, 2 cwt. of super-phosphate to supply 42 lb. of P_2O_5 , and 1 cwt. of potassium sulphate to supply 54 lb. of K_2O per acre. From the analysis of variance of the yield data and the main effects and interactions, it is observed that of all the treatments only K and P registered a significant increase in yield over the control this year. The effect of the basal dressing of cattle manure, though indicating an increase in yields, again failed to attain the level of significance. Of the main effects and interactions, it is found that P has increased the yields significantly in all the three cases under consideration, namely, with cattle manure, without cattle manure and the combined, while in the case of K the increase has not been felt with the basal dressing of cattle manure. The application of different manures was not found to influence the qualitative characters of the produce or control the incidence of any pests or diseases in the crop. The results of the three years' experiments are being scrutinized for drawing general conclusions.

(ix) *Pure cropping of groundnuts versus mixed cropping*.—To the four mixtures tried last year, two new ones, viz., groundnut-cotton and groundnut-tenai were added and the trial repeated. The calculated acre yields of groundnuts for the various mixtures are furnished below :—

	LB.
Groundnut, pure	1,036
Groundnut-redgram	975
Groundnut-castor	903
Groundnut-tenai	828
Groundnut-cotton	813
Groundnut-cumbu	721
Groundnut-cholam	580

Of the different crops grown in association with groundnut, cholam has again depressed the yields of groundnuts to the largest extent, while redgram has the least effect. In working out the economics

of mixed cropping this year, it is seen that except in the case of groundnut-tenai and groundnut-cumbu, the return from the other mixtures is more than from the pure crop.

(x) *Dormancy in groundnuts*.—Seed dormancy is a very important factor in groundnuts in view of the fact that seeds of this crop are produced underground, and any rains at harvest time would give conditions favourable for germination. As a rule the seeds of bunch varieties are non-dormant, that is, they sprout even on the parent plant if rains are received towards the ripening stages of the crop, while those of the spreading types are dormant. In tracts like Pollachi, Guntur and certain portions of Kurnool, where the bunch varieties are cultivated extensively, losses up to 60 per cent of the total yield have been reported in certain seasons due to the sprouting of seeds in the field. To have an exact idea of the dormant nature of seeds of some of the important bunch and spreading varieties and to confirm previous observations, about a dozen selected varieties had their freshly harvested seeds sown in the field at varying intervals and their germination studied. In the bunch varieties it was seen that sprouting started after two days resting period and that in about 4 days more than 90 per cent of the seeds had germinated. In the spreading varieties, about 60 per cent of the seed sprouted a month after harvest and about 90 per cent at the end of the second month. Among the largely cultivated spreading varieties, *Local Mauritius* takes about two months and A.H. 25 two and a half months to give good germination.

Hybridization work with desirable types to dissociate this combination of duration, habit and dormancy has already been taken on hand, and a number of new forms with bunch habit and dormant seeds have been isolated from the progenies of such crosses. These are being studied for their purity, dormancy, duration and yields.

7. *Gingelly*.—(i) *General*.—This crop was raised both during the cold weather and summer seasons. The improved variety, S.I. 89, has been reported to have given increased yields over the locals in the district trials conducted in parts of South Arcot, Chingleput and Tanjore. Seed multiplication of this variety is being done to meet the large demand from the districts.

(ii) *Yield trials*.—In the preliminary yield trials conducted during the cold weather with four promising summer varieties and four selections, most of them exhibited their suitability to cold weather cropping giving an increase of over 10 per cent over the control. The yields, however, were not statistically significant.

In the summer yield trials with the same set of varieties and selections, three varieties and four selections gave significant increase over the local. Of these, 877—a selection from *Sattur*—is outstanding giving a maximum yield of 684 lb. per acre and showing a high degree of resistance to shoot webber (*Antigastra catalaunalis*) and wilt attack.

(iii) *Collection of varieties*.—All the available varieties and types in the present collection were propagated for seed. The new introduction from Palestine which has recorded a high oil content of 60 per cent proved a complete failure both during the cold and hot weather seasons. From the collection of varieties, 50 outstanding single plants were isolated for earliness, branching, close setting of capsules, etc.

(iv) *Pure line cultures*.—Pure line cultures of 84 different types were examined in detail and further selfings done to maintain purity.

(v) *Hybridization*.—The cyclic crosses with six types having different economic characters were repeated this year as the seeds from the first cross failed to germinate.

F-2 families of nine crosses were studied for various economic characters and as many as 200 single plants combining a number of desirable economic characters were isolated.

(vi) *Insect and disease resistance*.—Attention was specially directed to the relative resistance to diseases and insect attack of the selections and progenies of crosses. Selections S.I. 897, 877, 6-2-133-1 and 38-12-14-1 which have given economic yields were also found to be highly resistant to shoot webber and wilt attack.

8. *Castor*—(i) *Yield trials of economic selections*.—Of the twelve selections that were under yield trials, two gave significant increase of 15 per cent over the control. Of these R.C. 642/4 (*Thana*) has the additional advantage of being shorter in duration than the control by about 1½ months.

Four of the promising selections were tried for yields in the Central Farm, Coimbatore. Strains R.C. 59-8-30 and R.C. 215 proved superior and gave yields of over 1,000 lb. of beans per acre. They have also an oil content of about 52 per cent.

(ii) *New varieties*.—Fourteen varieties collected during the year were studied in detail. Of these the variety from Kumbakonam is interesting in being the shortest duration type in the collections made so far. The Aden variety of castor received through the Imperial Council of Agricultural Research, though having a high oil content of nearly 54 per cent, proved a poor yielder.

(iii) *Selections*.—Thirty-two types selected last year had their seeds multiplied. Further selections of economic types from the newly received varieties were made.

(iv) *Inbred types*.—One hundred and thirty-six different types that were carried forward were studied for their morphological characters, duration, resistance to pests and disease, etc. Type plants were selfed for maintaining the purity of the cultures.

(v) *Horticultural types*.—Six horticultural types evolved by cross breeding were grown for seed multiplication. A large number of type plants were selfed to obtain pure seeds.

(vi) *Artificial crosses*.—Sixteen crosses were attempted with the idea of synthesizing some of the most important economic characters like earliness, profuse branching, quick production of fruit clusters, compact setting, and non-dehiscent nature of capsules. The progenies of some of the previous crosses were examined and 33 economic types singled out.

(vii) *Perennial castor*.—In connexion with a scheme for the stimulation of castor cultivation on the Nilgiris, a study of the perennial castor growing wild on the hills and in the plains was made. Perennial castor has been observed to thrive under varying conditions of soil and climate and flourish up to an altitude of 7,000 feet above sea level. There are a good many forms exhibiting differences in colour of stem, habit, branching, production, size and colour of seeds and oil content, of which only a few appear economic. In about a dozen types collected so far, the number of seeds per pound varied from 448 to 5,376 while the oil content ranged from 43.16 to 56.33 per cent. Contrary to common belief, the small-seeded types gave lower oil content than the large-seeded.

9. *Coconuts*—(i) *Manurial experiments*.—The new set of manurial experiments started last year was continued to determine the most economic dose of ammonium sulphate to be adopted. A second application of the scheduled dose of manures was made. The effect of the treatments on yields will be perceptible only 3 years after the starting of the experiment since there is an interval of nearly 2½ years between the formation of the floral primordia and harvest of nuts. Observations on leaf and flower production, setting of nuts, etc., are being made on individual trees in the different treatments.

(ii) *Green manure trials*.—Trials with cowgram, daincha, sunnhemp and groundnut were made to determine which of them are most suitable and the best seasons for growing them. Groundnuts have given fairly good yields for early sowings in April and June while cowgram was successful when sown in June-July. This is being verified by further trials.

(iii) *Burying of husks and leaves in coconut gardens*.—The burial of coconut husk and leaves in trenches between grown-up coconut trees started in 1937 was continued at Pilicode, Nileschwar III and Kasaragod stations. At Pilicode the treatment has induced a higher setting percentage of female flowers and has given yields equivalent to those obtained from a general dose of 3 lb. of ammonium sulphate plus 1½ lb. of potassium sulphate plus 2 lb. of bone-meal per tree. The yield data at Nileschwar III will be complete only after this year's harvests are over. At Kasaragod significant increases in setting percentage and the number of functioning leaves in the crown have been induced but further observations are necessary to judge the cumulative effect on the yield of nuts.

(iv) *Button shedding experiment*.—Shedding of female flowers or 'buttons' at different stages of development is of common occurrence in coconut and the contributory causes are under investigation.

(v) *Preservation of seed nuts*.—Further observation on preservation of seed coconuts was continued at Kasaragod and Tindivanam. It is seen that seed nuts can be preserved without drying up in a heap of sand. During a period of storage of six months 83 per cent of the stored nuts remained good at Kasaragod and 65 per cent at Tindivanam. The untreated nuts during the same period had all become dry and unfit for sowing purposes.

(vi) *Seedling studies*.—Fifty-seven comparisons between progenies from cross, natural and selfed seeds were made for characters such as girth at base, number of leaves and height of seedling. The study shows that in general the progenies from crosses are superior to natural and selfed while natural are superior to selfed seedlings.

(vii) *Germination studies*.—(a) The age of nuts at the time of harvest, viz., 13, 12 and 11 months gave no significant difference in their respective germination percentages. But the thirteen-months old nuts were found to take a longer time (167 days) to germinate than 11 and 12 months old nuts which took 117 and 120 days, respectively.

(b) The lowering of seed nuts by rope and dropping them from the crown of the tree about 27 feet height to ploughed soil underneath did not show any differences in the percentage of germination of the nuts.

(c) In a bunch, the nuts situated at the top give lesser percentage of germination (70 per cent) than those at the middle and bottom which give 100 per cent and 92 per cent, respectively.

(d) Germination percentage of nuts seems to be a varietal character. Studies conducted on twelve world varieties have given variations from 61 to 100 per cent. The number of days taken for germinating varied from 67 to 171.

(viii) *Coir and copra studies*.—In a preliminary study, the quantity of coir fibre obtained from husks of 9, 11 and 12 months old nuts was found to be the same, but was greater than that from 10 months old nuts. There was no difference in the length or thickness of the fibres obtained from husks of different age groups except the 12 months which gave slightly shorter length. These studies are being repeated for confirmation.

Copra studies in relation to age of nuts repeated during the year have confirmed last year's results.

(ix) *Coconut breeding*.—The hybrid trees from the cross between the tall and the dwarf types of coconut which came to flower last year yielded their first fruit in the form of two nuts. The copra from these nuts was on analysis found to contain

74.98 per cent of oil. This compares favourably with the tall type and gives one more indication of the promise that these trees hold out from the economic point of view. The F1 trees from the cross made to synthesize the two characters, high production of female flowers and high setting, came to flower 4 years and 2 months after transplanting. The trees are being studied for their inflorescence characters.

(x) *Other species of coconut*.—Two seedlings of *Cocos plumosa* and four of *C. australis* were newly obtained and planted at Kasaragod. Their development is being watched.

10. *Electroculture experiments*.—Various treatments mentioned in the last year's report are being continued on coconut trees. So far no effects due to the treatments have been noted. The experiments on groundnut conducted during 1939 summer did not give any significant differences in the yields.

11. *Collaborative items of work*—(i) *Wilt control experiments*.—The 1939 trials on the control of *Rhizoctonia* wilt in groundnuts undertaken at the Agricultural Research Station, Tindivanam, at the instance of the Government Mycologist, showed that the differences in wilt incidence in the several treatments were not significant. Further trials with slight modifications in the treatments are in progress in 1940 irrigated season.

(ii) *Study of the pests on groundnut, castor and gingelly*.—Facilities for the study of the major pests on groundnuts, castor and gingelly have been provided at the Agricultural Research Station, Tindivanam, to an assistant in Entomology who has been specially posted for this work by the Government Entomologist.

(iii) *Coconut beetle control*.—At the instance of the Government Entomologist, the trials to control the coconut beetle with *Green Muscardine fungus* were continued at the four coconut stations.

(iv) *Study of the development of free fatty acid content in commercial groundnuts*.—This investigation which has been carried out in this laboratory on behalf of the Agricultural Marketing Adviser to the Government of India was concluded in November 1939. A detailed report of the results with my review thereon has been forwarded to the Provincial Marketing Officer, Madras, and the Agricultural Marketing Adviser to the Government of India, Delhi.

12. *Miscellaneous*—(i) *Qualitative analyses*.—Two thousand and two samples of groundnuts, 1,344 samples of copra, 41 samples of castor and 10 samples of gingelly were analysed for their oil and free fatty acid contents. Estimations of the percentage of kernels to pods, number of seeds per pound, and weight to volume relationship of pods and kernels were made on all the selections of groundnuts under trial.

(ii) *Groundnut trials in the districts.*—In the Pollachi trials, two bunch and two spreading selections gave increased yields over the locals. Of the five short duration selections tried at the Agricultural Research Station, Guntur, A.H. 218 gave the highest acre yield. In the trials at Palur, some of the strains appeared promising. All these trials are being repeated.

(iii) *Castor trials in the districts.*—The castor trials with four promising strains conducted in certain centres of Anantapur, Bellary, Cuddapah, Kurnool and Salem districts have again been reported to have failed due to adverse seasonal conditions. In Madakasira, where the season proved normal, two of the strains yielded more than twice the local and were found to be shorter in duration by about a month. The trials are being repeated.

Seven annual types along with the Nilgiris perennial castor are being tried at the Agricultural Research Station, Nanjanad, the Botanic Gardens, Ootacamund, and the Pomological Stations at Coonoor and Kallar with a view to study the possibility of stimulating castor cultivation on the Nilgiris.

13. *Exhibitions.*—Exhibits from this section were sent to almost all the important exhibitions held in various parts of the Presidency. Show materials were also supplied to the Industrial and Commercial Museums recently organized in the districts.

14. *Lectures to students.*—A lecture on the genetics of groundnut, castor, gingelly and coconut was given to the third year B.Sc. students of the Agricultural College, Coimbatore.

15. *Committees and meetings.*—I acted as Secretary of the Research Council, Coimbatore, till the end of March 1940. I also served as a member of the Fodder Rotation Committee and the Annual Reports Scrutiny Committee.

16. *Enquiries.*—A large number of enquiries connected with oil-seed crops were received from the public and necessary information furnished. There was an exceptional increase in the enquiries regarding castor and its cultivation probably due to the recent rise in the price of castor seeds and oil.

17. *Seed distribution.*—Quantities of seeds distributed during the year direct from this section are furnished below :—

Coconut seed nuts	...	...	...	...	5,867
Coconut seedlings	...	...	...	...	1,628
Groundnut seeds	..	...	...	...	17,097 lb.
Gingelly seeds	...	...	...	...	280 lb.
Castor seeds	...	...	...	...	522 lb.
Cashewnut seeds	...	...	...	...	567 lb.
Napier and guinea grass slips	...	...	...	...	2,250
Citronella grass slips	...	...	...	...	50

18. *Papers and publications.*—A note on "The Industrial uses of Cashew and its Products" was contributed to the symposium on the "Industrial Utilization of Agricultural Products in India" held under the auspices of the Indian Science Congress at Madras. Leaflet No. 47 of the Department on "Cashewnut Cultivation" was revised and re-written for publication. A short note on "Raising Quality Coconut Seedlings" was prepared for publication in the Villagers' Calendar. A paper on "Cashewnuts" was read at the Agricultural College Day and Conference, 1939, by Assistant Sri C. T. Ittyachan.

19. *Audit.*—The annual audit of the accounts of the Agricultural Research Stations, Kasaragod, Pilicode, Nileshtar II, Nileshtar III and Tindivanam was conducted by me during the year.

COIMBATORE,
1st August 1940.

C. M. JOHN,
Oil-seeds Specialist.

ADMINISTRATION REPORT OF THE GOVERNMENT ENTOMOLOGIST FOR THE YEAR 1939-40.

I continued to be in charge of the Section as Government Entomologist.

The work of the Section is reported on under ten heads (1) General, (2) Teaching, (3) Research, (4) Systematics, (5) Bee-keeping, (6) Ericulture, (7) Plant Quarantine, (8) Propaganda, (9) Publications, and (10) Miscellaneous. Only a brief account of the work done is given under each head; detailed information is furnished in the Annual Report.

I.—GENERAL.

During the year under review there were 305 enquiries from different parts of the Presidency. Most of these related to pests of crops and their control and bee-keeping. In addition, the Entomological and Mycological staff in the districts dealt with a number of similar enquiries.

II.—TEACHING.

Students of the first year B.Ss. (Ag.) degree course were given 61 lectures and 32 practical classes in Zoology and those of the second year, 32 lectures and 25 practical classes in Agricultural Zoology. Besides these, classes were held in November 1939 and February 1940 for the benefit of the students who joined the short courses on 'Insect Pests' and 'Bee-keeping' respectively.

III.—RESEARCH.

Work under this head consisted chiefly of original investigations on the biology of major crop pests and their control. The above studies were confined to the following pests:—

(1) *The cotton stem weevil (Pemphorus affinis)*.—Work is being done for investigating the possibilities of biological control with the aid of funds of the Indian Central Cotton Committee, studies made on the incidence of the pest and parasites in Cambodia cotton showed that the population of the pest reached the peak in February and field parasitization by the parasites *Euderus*, *Rhaconotus* and *Spathius critolans* was very poor. The incidence of the pest and parasites in sixteen alternate host plants was determined. The three species of hosts—*Pavonia zeylanica*, *Corchorus acutangularis* and *Sida cordifolia* constitute new records. *Entedon*, *Dinarmus* and *Bruchocida* were encountered in the alternate hosts in addition to the three parasites already noted in cotton. A survey was made of the distribution of the weevil in the three districts of North Arcot, Salem and Malabar. It was not noted

on cottons in North Arcot district; in Malabar alternate host plants like *Triumfetta rhomboidea*, *Sida acuta*, *S. rhomboidea*, *Hibiscus esculentus*, *H. sinuata* and *Urena sinuata* were noted to be heavily infested by the weevil which would seem to suggest its indigenous character. Additional new data on the parasites, their distribution and seasonal incidence have been obtained.

(2) *The cotton bollworms (Earias and Platyedra)*.—The incidence of the bollworms in shed buds and bolls was determined in the months of December, January and February. The infestation by spotted bollworm reached the peak of 51.3 per cent in buds and 38.9 per cent in bolls in the first week of January; that of the pink bollworm was also heaviest in the first week of January with 6.1 per cent in buds and 4.8 per cent in bolls. Thereafter there was a pronounced decrease in the infestations even though the volume of shed material remained as high as at the beginning. The infestation percentages touched very low figures in early February with 1.7 per cent and 1.9 per cent in buds and bolls for the spotted bollworms and 9 per cent and 2 per cent for the pink bollworm. The incidence of the bollworms in burst kapas was determined from the ten pickings and the percentages were as follows:—(1) 76.0, (2) 85.5, (3) 84.0, (4) 65.2, (5) 52.5, (6) 49.3, (7) 53.8, (8) 55.4, (9) 53.2 and (10) 51.0. Studies made on the imperfect opening of bolls both under field and laboratory conditions would seem to indicate that the bollworms are the chief agents bringing about defective bursting in bolls. The extent of imperfect opening of bolls under field conditions worked out to 38.8 per cent, 34.4 per cent and 25.4 per cent for the three pickings. Field parasitization of the spotted and pink bollworms infesting shed cotton buds was poor. Parasites—*Microbracon lefroyi*, *M. greeni*, *Rhogas aligharensi*, *Bassus* sp., *Actia hyalinata* and *Elasmus johnstoni* were obtained from the spotted bollworms; *Microbracon gelechidiphagus*, *Apanteles petinophorae* and *Goniozus* sp. were recovered from the pink bollworms. Diapause in the larval stages of the pink bollworm has been noted in the caterpillars picked from ripe bolls in March and April; the period of diapause would seem to occupy more than 90 days.

(3) *Sugarcane moth borers (Argyria, Diatraea and Scirpophaga)*.—The control of borers by suitable experiments is under study. The effect of two earthings up of young canes on the infestation of the borer (*Argyria sticticrasis*) is under investigation. The collection of eggmasses from one month old crop for a period of two months has not given significant control of the pest. This method of control has to be discarded, more so, in view of the prohibitive cost of treatment (Rs. 60 per acre). Mass breeding of the egg parasite *Trichogramma minutum* is in progress for liberation in affected cane fields. Varietal resistance to borer attack (*Diatraea venosata*) was studied in four varieties Co. 413, Co. 419, Co. 417 and Poj. 2878. Of these, Co. 417 was found to be significantly more susceptible to attack. Life history studies of *Diatraea*

venosata were concluded and those of *Argyria sticticrasis* taken up. The following parasites were recorded from the field material;—*Trichogramma minutum* on the eggs of *Diatraea venosata* and *Argyria sticticrasis*; *Telenomus* sp. and *Tetrastichus* sp. on that of *Scirpophaga*; *Apanteles flavipes* on the caterpillars of *Scirpophaga* and *Diatraea* and *Shirakia* sp. on that of *Scirpophaga*; the pupal parasites *Tetrastichus ayyari* on *Argyria sticticrasis* and *Diatraea venosata*, and *Trichospilus* sp. on the latter. With the aid of the funds of the Imperial Council of Agricultural Research a regional survey of the pests of sugarcane is being done at Gudiyattam.

(4) *The chillies thrips* (*Scirtothrips dorsalis*).—Varietal resistance to thrips attack was tested in the Guntur varieties 399 and 367 along with the locals in the Central Farm. Guntur varieties which were known to be resistant at Guntur broke down in resistance and ultimately succumbed. Trials with more varieties are in progress.

(5) *The paddy stem borer* (*Schoenobius incertellus*).—Studies on the control of the borer by light traps were conducted at Coimbatore and at Vadavanur, a double crop area in Palghat taluk. The average incidence of white ears in December 1939 within a range of 360 yards was 1.4 per cent as against 2.8 per cent outside the range. At Vadavanur it was 2.5 per cent within a range of 550 yards as against 11 per cent outside the range.

(6) *The ber* fruit flies* (*Dacus correctus* and *Carpomyia vesuviana*).—Raking up the soil beneath the fruit trees to destroy the fly pupae was tried as a method of control for the fruit flies at Panyam with satisfactory results. The fly incidence ranged from 36 per cent to 55 per cent in treated blocks and 60 per cent to 100 per cent in untreated blocks. At our suggestion, the varietal resistance observed in a few trees is being utilized for budding purposes and for evolution of resistant varieties. It is interesting to record that *Carpomyia vesuviana* is able to remain as a maggot—in the soil inside the puparium for nearly 287 days.

(7) *The mango fruit fly* (*Dacus ferrugineus*).—Trials against the fruit flies at the Kallar Station consisting of raking up the soil round the trees and spraying of poisoned molasses at the time of emergence of flies proved very successful.

(8) *The citrus fruit sucking moth* (*Ophideres* sp.).—In view of the distinct preference shown by the moth for tomato as against citrus fruits, trap-cropping with tomato was attempted at a few citrus growing centres. Favourable reports have been received from Kodaikanal and Cuddapah.

(9) *The woolly aphid on apples* (*Eriosoma lanigera*).—In view of the indifferent control obtained through the insecticidal treatments biological control of the pest is being attempted. Consignments of the natural enemy—*Aphelinus mali*—a parasite which has done well in foreign countries, were got down for mass breeding at the Pomological Station, Coonoor. It is gratifying to note that

the parasites have settled down. After the parasites have been bred in large numbers colonies of these will be distributed to other infested apple gardens in the Nilgiris.

(10) *The groundnut surul* (*Stomopteryx nerteria*).—The life cycles of the pest and its parasites were studied at the Agricultural Research Station, Tindivanam; as many as five generations of the pest were passed in groundnut during the season. Of the thirty-five types tested for resistance to 'Surul' A.H. 669 was found to be the least attacked and A.H. 622 the most susceptible for the season. The light trap trials have indicated that (1) petromax gives better catches than hurricane light, (2) light at ground level attracts more moths than that at 5 feet and 10 feet elevations irrespective of the nature of the light used, (3) hurricane light kept at ground level attracts more moths than petromax at higher elevations and (4) more moths are attracted from 6-30 to 10-30 p.m. and 2-30 to 4-30 a.m. The seasonal abundance of moths was found to be highest in September. The effect of 'surul' attack on yield is being studied.

(11) *The gingelly caterpillar* (*Antigastra catalaunalis*).—Of the ten varieties tested for resistance to the caterpillar attack, selection S.I. 6.2.133.1 was found to be the most susceptible while S.I. 882 was the least attacked. The biology of the pest and a few parasites like *Microbracon hebetor* and *Goniozus* sp. was worked out.

(12) *The castor semilooper* (*Achaea janata*).—Four mass emergences of moths were noted during the season, the first coming off in September. The problem of how the pest carries over during the off-season is under investigation.

(13) *The freckled yellow disease of cholam*.—This disease is transmitted by *Peregrinus maidis*. The raising of non-cereal border crops like *Crotalaria juncea* and *Sesbania speciosa* all round the sorghums has not been helpful in preventing the immigration of the bugs from the bunds and reducing the incidence of the disease thereby.

(14) *The tobacco caterpillar* (*Laphygma exigua*).—The ragi trap beds that were raised in the off-season in the Chirala nursery in July have not been able to attract the moths in appreciable numbers. The improved method of pest control, namely, the alternate sowing and pulling up ragi seedlings from the edges of tobacco beds at intervals of four days, was adopted and has given good results.

(15) *The coconut beetle* (*Oryctes rhinoceros*).—The removal of the beetles with the aid of barbed prods and sanding of the holes in the treated trees as against removal of beetles alone in the controls, have clearly indicated the possibility of control by this method, as seen by a reduction in the number of beetles and new holes in treated trees. The sand plugged holes are seldom retentive. Studies on the parasitic green muscardine fungus have shown that it is viable for 18 months in dung kept in pots. In the test pits opened at the four Agricultural Research Stations on the West

Coast and inoculated with the fungus, the beetle grubs were not acted upon in larger numbers even though the fungus was present. The exact cause for the failure of the fungus to act on a larger number of grubs is being investigated at the Insectary by a new set of experiments.

(16) *The cardamom thrips (Tachiothrips Cardamomi)*.—As scabs on pods are the result of thrips damage done to them in the blossom stage, spraying and dusting trials were made on the blossoms with tobacco decoction, potash fish oil soap, bordeaux mixture and sulphur. There have been in all five pickings but the last being very poor has not been taken into account for experimental purposes. The pods were graded into good and bad according to the total absence and extensive occurrence of scabs. The figures so far obtained have shown that tobacco decoction treatment has given uniformly good results by giving enhanced percentages for good pods and low percentages for bad pods.

(17) *The 'Pollu' disease of pepper*.—Experimental trials with five fungicides and two insecticides with appropriate controls were made on pepper in Payyanur, North Malabar. Of the fungicides 'Mycol' alone has given encouraging results. Calcium arsenate appears to exert a deleterious effect on the vines inducing heavy spike fall.

(18) *The jasmine mite (Eriophyes sp.)*.—More extensive experiments using sulphur for the control of the jasmine mite have been started in Tudiyalur to determine the cost of treatment and to find, if the addition of diluents like wood ashes to the insecticide would secure reduction in the cost of the insecticide without impairing the effectiveness of the treatment. From the results obtained so far, the treated bushes seem to be free from blisters when compared with the untreated bushes in the neighbouring gardens.

(19) *Pests of stored grains*.—Experiments on the control of the pests of paddy and cholam in storage would seem to indicate that paddy does not suffer relatively so much from pests as cholam, that *Calandra* is the most serious pest of cholam while *Rhizopertha* is the important pest of paddy. Sun drying at intervals was by far the best method of protecting the pests in cholam in storage. It was equally good against the pests of paddy barring *Acorus* and *Derris*. Neem leaves have been found to be not so efficient as is believed by the ryots.

Investigations like the study and action of indigenous and foreign insecticides on the crops pests, chemotropic response of insects and electroculture formed additional subjects of research. The insecticidal trials included dusting of sulphur against *Saissetia nigrum scales* and *Pseudococcus virgatus*. 'Acme' lead arsenate spray against *Prodenia* caterpillars, Pyrethrum dusts made out of Pyrethrum flowers sent from Kotagiri against *Prodenia* and *Plutella* caterpillars, root dusts of *Derris elliptica* from plants raised at the insectary against *Epilachna* beetles, Aphids on lablab bottle-gourd and chrysanthemum; the results have been very satisfactory in all cases excepting in the first mentioned instance.

Trials with Citronella, Eucalyptus, Lemon grass oil, Terpenol and Cinnamon were made in Minnesota traps to study the chemotropic response of insects. Of these, oils of citronella and clove attracted the male flies of *Dacus correctus* to a limited extent; sugars have not been helpful in attracting pests of crops.

Electroculture trials were made against pests like *Lasiocampid* caterpillars on Sapota, Aphids on chrysanthemum and mealy bugs on sugarcane but the results were not satisfactory.

IV.—SYSTEMATICS.

This item includes a study of the insect collections made in the course of pest surveys undertaken by the staff with a view to classifying them into their natural groups and families and then identifying them. The collections of the section were examined, worked up and referred to their respective families, general, etc. The insects that could not be named were sent to the Imperial Institute of Entomology, London, and Bureau of Entomology, Washington, for determination; one consignment each was sent to the above-named institutions and three consignments each were received back from each of them after determination. In addition, several insects sent by the various parties and entomological assistants in the districts, were duly identified and the names communicated to them. In the course of such studies several insects new to science and new to our collections have been discovered. Help was rendered to other institutions like Imperial Agricultural Research Institute either by loaning or exchanging specimens. Cataloguing and indexing of the family Curculionidae is in progress.

V.—BEE-KEEPING.

From the increase in the number of hives in this Presidency from 2,892 to 4,323 during the year under report, it is evident that bee-keeping as a cottage industry is gaining rapid popularity. From the forty colonies maintained at the Apiary for experimental and demonstration purposes the average yield of honey per hive was 7 lb. and the maximum 15 lb. 2 oz.

Research mainly consisted of trials at the control of bee enemies, domestication of hill bees, swarm prevention and artificial feeding. The wax beetle and the lesser wax moth very rarely assume the status of pests and could be controlled by cleaning the base board once a week. Trials are in progress to cross the hill variety with the plains variety with a view to improve the staying habit of the former and the honey gathering capacity of the latter. Of the various swarm prevention methods tried, increasing the number of brood chambers alone seems to give slightly encouraging results. Artificial feeding is necessary in times of drought and has to be done if the colonies are to be preserved. Sugar solution has been found acceptable to the workers as a substitute for nectar but they have not taken kindly to pollen substitutes like wheat and bengalgram flours. Trials with other substances are in progress. From the studies made on the response of bees to environmental factors,

it was found that the pasturage and time of opening of the flowers were the most important factors that govern the activity of the bees. Trials made on rock bee honey extraction and preservation have proved that, of the three appliances devised, honey extractor was the best and that artificial ripening and storage in clean airtight receptacles were necessary to prevent fermentation.

On the propaganda side steps were taken wherever necessary to create interest in bee-keeping by arranging exhibitions and giving information and advice by correspondence. The third Annual Honey Week that was celebrated all over the Presidency during January 1940 was yet another step in the direction. Dearth for comb foundation sheets has now been got over by importing a comb foundation mill from America which could be worked to produce the required quantity of sheets; the demand for the sheets is on the increase. Already 40 lb. of sheets have been distributed. The Government has been pleased to extend the bee-keeping scheme for Chittoor district by another year with a view to popularize this industry.

VI.—ERICULTURE.

Rearing of eri silkworms was continued throughout the year for supplying eggs to rearers in different parts of the Presidency and also for demonstration to students. It is possible to market the cocoons now; the Mysore Spun Silk Company, Limited, Chennapatna, Mysore State, are prepared to pay 8-12 annas per lb. of pierced cocoons depending on the quality.

VII.—QUARANTINE SERVICE.

During the year under review, 75 lots including samples of seeds, bulbs, live plants, etc., were examined for insect pests, fumigated wherever necessary and certificates issued. These lots included materials intended to be sent by officers of the department and others to countries outside India and those imported into India from outside.

VIII.—PROPAGANDA AND CAMPAIGNS.

Much progress has been made in the demonstration of remedial measures against insect pests since the deputation of our assistants and those of the Mycologist who had received training in Entomology, for work in the districts. By this arrangement, it has been possible to give timely help in the control of pests to the ryots. The assistants were actively associated in the organization of pest campaigns and exhibitions, in addition to their being in charge of the Pest Act operations against the groundnut hairy caterpillar. In addition, exhibits such as show cases, insect pests, posters, charts and bee-keeping appliances were sent to the various exhibitions for purposes of propaganda. Efficacy of calcium arsenate dusting against *Epilachna* beetles on brinjals has been so well brought to the fore that the ryots are eager to undertake the carrying out of the remedial measure by themselves; similarly is the case with tobacco decoction spraying against tobacco aphids in Northern Circars. The headquarters staff were also engaged in insect control

work in addition to the original investigations on hand, in response to calls from the Central Farm and the breeding stations and Coimbatore and Nilgiris districts.

IX.—PUBLICATIONS.

The following original papers embodying the results of the investigations carried out by the section have been prepared for publication in the scientific journals (1) *Tetrastichus ayyari*—a pupal parasite of cane moth borers of South India, (2) The wax beetle *Platylolium alvearium* in South India, (3) Studies on the spotted bollworms of cotton—*Earias fabia* and *E. insulana*, (4) *Euborellia stali*—a pest of groundnut, (5) The fruit fly—*Dacus ferrugineus dorsalis* and its status in South India, (6) Notes on three predatory bugs of caterpillar pests of Daincha (*Sesbania aculeata*), (7) Studies on *Diatraea venosata*—a pyralid borer pest of sugarcane in South India, (8) The host plants and associated parasites of the cotton stem weevil—*Pempheres affinis*—of South India, (9) The rock bee honey—its extraction and preservation, (10) *Spaethius vulnificus*—a possible parasite of the cotton stem weevil (*Pempheres affinis*) and (11) A note on the Anophelene mosquitoes of Coimbatore and its surroundings.

X.—MISCELLANEOUS.

Artists' section.—The following items of work were executed under my supervision:—Pen and ink drawings, graphs and charts 259; posters 141, paintings 280, labels 1,481, photographs 726; photo prints 2,243; lantern slides 270; bromide enlargements 491 and retouching negatives, prints, etc., 242.

Sectional meetings.—At the meetings of the staff short talks on the problems in which they are engaged, reviews of recent literature and accounts of the tours undertaken by the different members of the section were given.

University examinations.—I was Examiner in Agricultural Zoology and assistant Sri K. P. Anantanarayanan in Zoology for the B.Sc. Ag. degree examination.

Indian Central Cotton Committee Meeting.—I attended by special invitation the meetings of the Indian Central Cotton Committee held in January 1940 at Coimbatore.

Research Council.—I attended the meetings of the Research Council. As Secretary of the Council, I had to devote some time in correspondence with the district officers in charge of the Agricultural Research Stations regarding the Cropping Schemes.

Training in Entomology.—The following officers of the Mycological Section were given training in Entomology during the year so as to enable them to attend to insect control work also in the districts:—Messrs. C. S. Gopalaswami Rao, P. S. Suryanarayana Ayyar and K. Achyuthan Nambiyar.

COIMBATORE,
7th August 1940.

M. C. CHERIAN,
Government Entomologist.

ADMINISTRATION REPORT OF THE GOVERNMENT MYCOLOGIST FOR THE YEAR 1939-40.

I was in charge of the Mycological section and the Microtome section throughout the year.

I.—MYCOLOGICAL RESEARCH.

1. *Rice—Blast—Piricularia oryzae*—(a) *Studies in varietal resistance*.—Forty-two strains of rice consisting of twenty-nine departmental strains and thirteen new selections were supplied by the Paddy Specialist for studying their relative resistance to *Piricularia oryzae* under field conditions in Coimbatore Central Farm. To ensure favourable conditions for infection, each variety was planted in rows alternating with rows of the susceptible Adt 10. The belt of outskirts also consisted of Adt 10. Periodical observations were made and the amount of leaf, node and neck infection for these varieties were recorded. Of the strains studied, Co 4 was found to be the most resistant. Co 11 and the new selections 11348 and 10998 obtained from crosses of Adt 10 and G.E.B. 24 are also very promising.

(b) *Varietal resistance in relation to period of sowing*.—Ten varieties of rice consisting of three susceptible strains (Adt 3, Mtu 9 and Co 9), four moderately resistant strains (Co 2, Co 5, Co 7 and Mtu 5) and three resistant strains (Co 4, Co 11 and Adt 6) were selected for this field experiment. The highest incidence of disease was found in the October planting, Co 4 remaining resistant in all the plantings. Adt 6 which was found to be the most resistant last year is found to be less resistant than Co 4. The incidence of disease was very low in the November planting.

Viability of Piricularia oryzae.—The fungus in disease specimens of rice collected and preserved in the laboratory was found viable over a period of 15 months.

2. *Helminthosporiose of cereals*—(a) *Rice—Helminthosporium oryzae*.—As the fungus does not sporulate well in Quaker oats and French bean agars, other media such as potato dextrose agar, potato dextrose plus tannic acid agar, cornmeal and sand, rice husk with 2 per cent dextrose and malt agar were tried. Good sporulation was obtained in cornmeal sand medium and in potato dextrose agar with tannic acid.

Another observation made during the progress of the work was that there was better sporulation in Petri dish cultures than in tube cultures indicating that a thinner medium induced better sporulation. This observation was confirmed again by varying the thickness of the medium in Petri dish cultures.

Sporulation in relation to humidity.—Cultures of the fungus kept at humidities of 66 per cent, 81 per cent, 95 per cent and 100 per cent respectively did not show any difference in their capacity for sporulation.

(b) *Toxin production*.—Toxins injurious to seedlings were not found secreted during the growth of the organism.

(c) *Nature of enzymes produced by different species of Helminthosporium*.—Four species (*Helminthosporium oryzae*, *H. tetramera*, *H. sativum* and *Helminthosporium* spp. from ragi) were tested for their enzyme production. All the four species were found to produce amidase, diastase, erepsin and emulsin. Lipase was found only in *H. oryzae* and *H. sativum*. Though all the four species produced oxidase, there was considerable difference in the amount produced, the maximum production being from *H. oryzae* and the least in the species from ragi. Inulase production was good only in *H. oryzae* and *H. sativum*.

(d) *Pathogenicity—Inoculations*.—Ten weeks old rice seedlings inoculated with *H. oryzae* on leaf blades and leaf axils were kept inside inoculation cages. Discolouration at the seat of inoculation was evident within 24 to 36 hours and developed into well-defined brown spots. The infected spots were not found to spread any further when the pots were removed outside indicating that a humid atmosphere is necessary.

Rice seedlings 15 days, 30 days and 45 days old were inoculated with *H. oryzae*. It was found that the percentage of infection in leaf axils and leaf blades was 80 to 90 while in the stem it was only 30 to 40. The difference in the age of the seedlings had no significant influence on the amount of infection obtained.

Inoculations of seedlings of different varieties of rice (Mtu 1, 2, 3, 5, 6, 11 and 12) showed that all these varieties were equally susceptible.

Cross inoculations with H. oryzae.—Inoculations of wheat and tenai seedlings showed that they take infection as readily as rice seedlings. Ragi and maize seedlings showed a small percentage of infection while cumbu and sorghum did not take infection. Wound inoculations of seedlings of ragi, maize, cholam and cumbu however were completely successful.

The leaves and ears of the following plants were also inoculated: rice, wheat, barley, tenai, oat, ragi. Successful infection was obtained in rice leaves and ears, tenai leaves and ears and wheat and barley leaves and ears. Oat and ragi showed a few cases of leaf infection only. Well-grown plants of cumbu sorghum and maize without earheads were also inoculated. Maize alone showed some leaf infection. Wound inoculations gave good infection in all these cases. The controls were all free from infection.

Soil and seed inoculations.—Three series of experiments were carried out. In the first series, healthy seeds of rice were artificially infected with *H. oryzae* and then sown in sterilized soil. In the second series, healthy seeds were sown in artificially infected soil. In the third, both seed and soil were infected. It was found that both the seed and the soil could act as sources of infection and that the maximum amount of infection was when both the seed and the soil are infected.

In none of these experiments the phase of the disease known as "seedling blight" has been found.

Thermal death point of H. oryzae.—The thermal death point was found to be about 51°C for an exposure of ten minutes and about 52°C for five minutes. Rice seeds are not killed by immersion in hot water for 30 minutes at 56°C; hence the recommendation of hot water treatment at 53°C for 10 minutes in Japan where the seedling blight is severe.

3. *Rice—False smut—Ustilagoidea virens.*—The fungus was brought into pure culture and comparative cultural studies of the fungus were made. Quaker oats agar was found to give the best growth.

4. *Ragi—Blast—Piricularia spp.—Incidence of disease under field conditions.*—The disease was not found to any serious extent on account of the bright weather prevailing during the heading time.

Incidence of disease in relation to time of sowing.—Twelve varieties of ragi ranging in duration from 105 to 135 days were sown every month from January to December and the amount of ear infection recorded. It was found that the crops sown in June, July and August suffered heavy infection and that the infection was directly related to the high humidity prevailing at the time of heading and maturity.

Varietal resistance.—Of the twelve varieties tried, none was found to be resistant. Heaviest infection ranging from 69 to 98 per cent was found in the August sown crop.

Cross inoculations.—Inoculations were conducted on nine different host plants with *Piricularia* strains isolated from ragi, tenai and rice. The ragi and tenai *Piricularia* were found to infect ragi, tenai, two strains of wheat, oat, barley, maize and *Dactyloctenium aegyptium* but not rice. The rice *Piricularia* was found to infect all these except ragi.

5. *Areca palm—Mahali—Phytophthora arecae—Field experiments for control.*—The field experiment for the determination of the economic strengths of Bordeaux mixture and the most suitable spreaders is being continued in Mundaji village in South Kanara as no results were obtained for want of disease in the experimental area during the year 1938-39 and 1939-40.

Oospore production in Phytophthora species—Oospore formation in single-strain cultures.—Maize meal agar cultures of *Phytophthora parasitica* produce oospores at 20°C and *Phytophthora meadii* at 15°C. The other *Phytophthoras* from areca, palmyra, citrus and tobacco did not produce oospores either at 15°C or at 20°C.

Shelled and unshelled arecanuts inoculated with *P. arecae* and *P. palmivora* and incubated at 20°C were not found to produce any oospores.

Oospore formation in paired cultures.—Paired cultures were not found to produce oospores at laboratory temperature (27°-28°C). Some of these however produce oospores when incubated at 15° or 20°C.

Of ten different pairs incubated at 20°C, the combinations of areca × hevea, areca × citrus, areca × palmyra and areca × castor were found to produce oospores. From a study of the paired cultures of the *palmivora* group, it has been found that oospores were produced only from *arecae* and hevea strains, the citrus and palmyra strains not producing any.

The oospores of *P. meadii* are found only when paired with *P. arecae* and those of *arecae* on pairing with palmyra and citrus strains.

Enzyme production in Phytophthora species.—Areca, palmyra, citrus, hevea and tobacco *Phytophthoras* were found to produce lipase. They were not found to produce trypsin, erepsin or oxidase.

Inoculations with Phytophthora species.—Wound inoculations on leaves of *Agave wightii* with *Phytophthora* species from areca, hevea, citrus, palmyra, castor and tobacco gave infection in all cases except with the palmyra species.

Arecanuts about six months old inoculated with an old and new isolation of *P. arecae* gave infection in the case of the new isolation only. Arecanuts inoculated with *P. meadii*, *P. palmivora* and *P. parasitica* were not infected. Infection of five months old arecanuts was obtained with both the isolations of *P. arecae* and also with *P. meadii*. There was no infection with *P. palmivora*.

Cocoa fruits wounded as well as unwounded were inoculated with *P. arecae*. Wound inoculation caused rapid decay while inoculation of unwounded surface showed only slight infection at the seat of inoculation.

Fresh isolations of Phytophthora species.—The strain of *P. palmivora* from coconut was obtained from a bud rot affected coconut in Malabar. Another species agreeing with *P. palmivora* was isolated from diseased citrus roots from Bezwada.

6. *Glæosporium disease of arecanuts.*—The manurial and spraying trials did not give any significant results. The experiment is being repeated with modifications by increasing the quantity of manure applied, to two pounds per tree.

7. *Redgram—Wilt—Fusarium vasinfectum*.—Redgram seeds treated with ceresan are under field trial to see how far the disease is controlled by this treatment.

Varietal resistance trials.—To study the resistance to wilt, fifty-four selections are under trial in duplicated and randomized plots. The work is being done with the co-operation of the Cotton Specialist.

8. *Groundnut—Wilt—Macrophomina phaseoli*.—Field experiments for the study of wilt are being conducted in collaboration with the Oil-Seeds Specialist.

Soil and seed treatments.—No definite conclusions could be drawn from the field experiment at Tindivanam as the maximum amount of infection even in the untreated control plots was only 6.9 per cent. The experiment has been repeated with some modifications.

Varietal resistance.—The experiments laid out at Tindivanam in 1939 have not given any significant results and the incidence of wilt also has not been high. The experiment has been repeated this year and the final results are awaited.

Incidence of wilt in relation to time of sowing.—Another set of experiments has been started this year to ascertain the incidence of wilt in relation to the time of sowing. A.H. 42 a susceptible bunch variety has been sown in March and the sowings have been repeated in April, May and June. Observations are in progress.

9. *Sugarcane—Red rot—Colletotrichum falcatum—Pathogenicity*.—Two strains of the fungus were inoculated on sugarcane varieties, Poovan, Co. 419, Co. 421, *Saccharum spontaneum* (local), *S. spontaneum* (Galagah) and leaves of maize and *Arundo donax*. The sugarcane varieties and *S. spontaneum* varieties and wounded leaves of maize were successfully infected. Wounded leaves of *Arundo donax* did not take infection.

Method of infection.—Different methods of inoculation showed that inoculations through bores in setts and soil inoculation produce infection in shoots. Smearing the cut ends or the root bands of setts with cultures of the fungus did not produce any infection.

Spread of infection in relation to temperature.—Sugarcane setts were inoculated and kept at temperatures varying from 15°C to 34°C. It was found that strain No. 1 spreads more rapidly than strain No. 2 at all temperatures. The maximum spread was found to be between 30°C and 35°C. At 15°C there was very little spread and there was gradual increase with the rise in temperature. The spread is quicker in top setts than in bottom setts.

Thermal death point.—The spores of both the strains are killed by an exposure of five minutes at about 51°C. The appressoria of the fungus however are not killed at this temperature for the same exposure.

Enzyme production.—The enzymes amidase, lipase, inulase, erepsin, and trypsin were produced in both the strains. The enzyme emulsin was not produced in strain No. 2 and only a trace was found in strain No. 1.

10. *Sorghum—Leaf spot—Colletotrichum graminicolum*.—The fungus was isolated from sorghum leaves. Successful infection was obtained on leaves of sorghum seedlings and wounded midrib of sugarcane leaves. The time taken for infection of sorghum leaves varies from 6 to 14 days according to temperature conditions.

11. *Cotton—Seedling blight and boll rot—Colletotrichum indicum—Pathogenicity*.—Infection studies show that the fungus penetrates the cotyledons both through the stomata and by piercing through the outer wall of the epidermis. In the collar region penetration is through the epidermal wall. The penetration takes place in about 18 hours after inoculation.

Soil infection.—Cultures of the fungus were mixed with sterilized soil in pots. These were then sown with surface sterilized H-1 cotton seeds. Within a week after emergence, all the seedlings were killed. When the pots were resown after a month, 66 per cent of the seedlings were killed.

Infection in relation to temperature.—Inoculated seeds were sown in pots with sterilized soil and kept at different temperatures ranging from 15°C to 34°C. The maximum amount of infection was obtained between 20° and 30°C.

Cross inoculations.—Seedlings of *Gossypium stocksii*, *G. harknessii*, *G. armourianum* and *G. Davidsonii* were inoculated. On *G. stocksii* alone there was discolouration at the collar region but there was no mortality or further spread. A cross between *G. hirsutum* and *G. arboreum* did not take infection. *Aristolochia bracteata* leaves were inoculated successfully.

Germination of infected seeds.—The germination of delinted cotton seeds soaked in spore suspensions was found to be very seriously affected. Only one per cent of the seeds germinated while the controls gave 37 per cent germination.

Seed treatment.—The effect of seed treatment with ceresan on the incidence of disease in artificially infected seeds was tested in germination trays, pots and small plots. Seeds were first infected and then dry dressed with ceresan. The treatment was found to be very successful in controlling seed infection, the germination and survival percentages approximating those of healthy and normal seeds. The treatment with ceresan was however not successful in controlling soil infection when there were heavy rains at the time of sowing. When there are no rains, the treated seeds give good results while the controls give a poor stand.

Infection in relation to the water content of the soil.—The moisture holding capacity of potting earth was determined and series of pots containing soil with different percentages of moisture

were prepared. Healthy and infected seeds were sown in these pots after keeping them inside cages. The pots were weighed every day and the deficiency made up by the addition of distilled water. The results showed 50 per cent soil moisture to be the optimum for germination. The highest incidence of disease was found in soils containing from 30 per cent to 50 per cent moisture.

Toxin production.—Seedlings placed in filtrate of two-day old liquid cultures turned flaccid in 24 hours. Filtrates from four-day and six-day old cultures produced wilting in 24 hours while the filtrate from ten-day old cultures produced drying of the cotyledonary margins in addition to wilting. In four-week old filtrates drying and wilting occurred in 12 hours. The controls were all healthy. The toxic effect is thus found to increase with the age of the culture. Boiled filtrates were not found to be toxic showing that the toxin is not thermostable.

Enzyme production.—The production of amidase, lipase, erepsin and small quantities of emulsin and inulase was noted.

Comparative studies of Colletotrichum indicum with other strains and species of Colletotrichum.—Isolations of *Colletotrichum* from chilli, *Aristolochia* and local cotton were compared with *C. indicum*. The first attempt at inoculation with *C. capsici* on cotton seedlings was not successful. The fungus was then grown on sterilized cotton seeds and as this culture gave 66 per cent infection of cotton seedlings, this was used for further inoculations. All the four strains are found to infect cotton seedlings but some are more virulent than the others.

12. *Citrus—Leaf fall, fruit rot and canker—Phytophthora* Sp. —*Field experiments for control.*—The data obtained during the course of the spraying experiments at Wynaad were analysed. The results show that

- (1) spraying was very effective in controlling the leaf fall,
- (2) a single spraying after the onset of the monsoon and just at the time the first signs of disease are noticed (late July) was more effective than a single spraying just before the onset of the monsoon (late May),
- (3) two sprayings were not significantly more beneficial than the single spraying given in July as regards leaf and fruit fall, and
- (4) the total yield of the twice sprayed plots was significantly higher than those of all other plots.

13. *Ginger—Rhizome rot—Pythium species—Field experiments.*—The results of the soil and seed treatments showed that soil treatments were not effective. In the seed treatment series, ceresan was found to control the disease more effectively than the other treatments.

Treatment with 0.1 per cent mercuric chloride solution was again found to be the most effective in reducing loss during storage.

Field trials with seeds treated with mercuric chloride, ceresan and Agrosan G have again been laid out.

II.—VIRUS DISEASES.

1. *Sugarcane—Mosaic—Varietal resistance.*—The annual field trials to estimate the relative resistance of sugarcane varieties to mosaic were continued. Sixteen varieties were included in the trial. Co 205 (Pusa) and Co 434 continued to show resistance as in previous years. Uba (S.H. 38) and Co 422 have been free during the two years they have been under trial.

Insect transmission.—Transmission experiments with *Aphis maidis* and *Toxoptera graminis* were tried without success.

2. *Cotton—Sterility disease.*—The disease has been noticed during the year in the Coimbatore Cotton Breeding Station in indigenous types. Two species of jassids were found feeding on these cotton plants. Transmission experiments with both the species of insects did not give any successful transmission.

Transmission through grafting.—At Hagari and Adoni preliminary transmission experiments with a total of 50 plants have given promising results. Three cases of transmission at Hagari and two more at Adoni were obtained as a result of grafting diseased scions on healthy stocks.

3. *Tobacco—Ring spot.*—The disease was noticed in Coimbatore and was successfully transferred to *Nicotiana glutinosa* and *tobacco*. It was however found that the symptoms disappeared later and the new leaves from the inoculated plant did not prove infective.

4. *Brinjal—'Little leaf'.*—The disease was successfully transmitted through grafting to the following additional hosts: (1) *Withania somnifera*, (2) *Solanum tuberosum*, (3) *Solanum Pubescens* and (4) *Solanum Scaforthianum*.

Insect transmission.—*Eutettix phycitis* was not able to transmit the disease to tomato, tree tomato, tobacco and *Physalis peruviana*. The insect however was able to transmit the disease to *Solanum xanthocarpum*, *Solanum trilobatum* and *Datura fastuosa*.

5. *Cardamom mosaic.*—Transmission experiments with thrips (*Teniothrips cardamomi*) as vectors were not successful.

III.—ADVISORY WORK.

One hundred and sixteen specimens of diseased plants received for examination and technical advice were attended to during the year. Besides these several enquiries relating to plant pathological problems were also dealt with by correspondence.

IV.—QUARANTINE SERVICE AND LEGISLATIVE MEASURES.

Thirty-one consignments of plants and seeds were examined or fumigated. Samples from sixteen consignments of tamarind meant for export to Egypt were examined and necessary certificates issued.

The Agricultural Pests and Diseases Act of 1919 continued to be in force during the year in respect of the bud-rot disease of palmyra and coconut palms in East Godavari, West Godavari, Kistna and Guntur districts and in the Palghat, Walluvanad and Ponnani taluks of Malabar. The special staff appointed for the work though very inadequate have been doing useful work.

V.—PROPAGANDA.

Mycological exhibits consisting of attractive posters, charts and specimens were displayed in the following exhibitions:—

- (1) Agricultural exhibition during the College Day and Conference at Coimbatore.
- (2) All-India Khadi and Swadeshi exhibition at Calicut.
- (3) All-India Khadi and Swadeshi exhibition at Madras.
- (4) District Agricultural and Industrial exhibition at Nellore.
- (5) Agricultural exhibition during the Cattle Show at Tiruppur.
- (6) Agricultural exhibition during the Health and Baby week at Erode.

Propaganda through radio.—An article in Tamil on "Plant diseases and their control" was sent for radio talk.

VI.—TEACHING.

Thirty-five lectures in Mycology and plant pathology were delivered to the students of B.Sc. (Ag.) III and thirty practical classes conducted. Thirteen lectures on horticulture with 8 practical classes were given to the same class. A short course on plant diseases and their control was conducted for the special short course students.

VII.—MICROTOMY.

The microtome section continued to serve the needs of all the sections in the institute as well as the officers in the districts. Five hundred and three materials were received, 382 materials embedded and 368 blocks cut. One thousand four hundred and twenty-two slides were prepared, 1,263 slides stained and 1,268 slides mounted.

VIII.—PUBLICATIONS.

1. 'Pollu' disease of pepper—Paper read at the College Day and Conference.

2. Studies on the parasitism of *Colletotrichum indicum* Dast. by Sri T. S. Ramakrishnan—Presented at the Agricultural section of the Indian Science Congress, 1940, and subsequently sent for publication in the *Indian Journal of Agricultural Science*.

IX.—TRAINING IN MYCOLOGY.

Messrs. C. Krishnamurthi, N. Raghava Rao and E. R. Gopala Menon, Assistants in Entomology, were given training in Mycology for three months. Sri R. Narasimhachari, Assistant Agricultural Demonstrator in Entomology is undergoing training in Mycology from 5th June 1940.

COIMBATORE,
31st July 1940.

K. M. THOMAS,
Government Mycologist.

ADMINISTRATION REPORT OF THE RESEARCH
ENGINEER, COIMBATORE, FOR THE YEAR 1939-40
(1st JULY 1939 TO 30th JUNE 1940).

I submit herewith the twelfth administration report of the Agricultural Research Engineer, and the second fasli report.

1. *Charge*.—I remained in charge throughout the period which is the second year of working since the reorganization effected from 17th October 1938.

2. *Staff*.—A Supervisor's post was sanctioned temporarily by Government for a period of one year from 1st July 1939, but was not filled as the Madras Services Commission did not get suitably qualified candidates.

3. *Teaching—B.Sc. (Ag.) Degree Course*.—The B.Sc. (Ag.) I and II year classes were taught general Mechanical Engineering and Agricultural Implements and Machinery, by me and details of the total number of lectures delivered and practical classes conducted are furnished below :—

	Lectures.		Practical classes.	
	Numbers.	Hours.	Numbers.	Hours.
B.Sc. Ag. I year	10	10	22	66
B.Sc. Ag. II year	45	45	43	129

Twelve practical classes totalling eighteen hours were conducted for the Short Course students. They were taught the practical handling and working of farm machines, pumps and oil engines.

A special lecture was given to the pupil-teachers and students of the Wardha Training School, Forest College, Coimbatore, on 31st January 1940, illustrated with agricultural cinematograph films.

4. *Implement prices*.—As a result of the outbreak of war the local hardware markets became more unsteady than ever and prices of iron, steel and other metals both in their raw and finished stages began to fluctuate feverishly. The increase in some instances has been as high as 100 to 200 per cent over their pre-war levels. On account of this abnormal rise in cost, no planned programmes for cheapening costs of implements could be effected, but on the contrary a small increase by the various manufacturers was allowed to meet the war conditions and also on account of the levy of the surcharge on railway freights. In almost all cases, this enhancement did not put up the values by more than a few annas and the maximum rise works out only to 6½ per cent.

5. *Ploughs*.—A noteworthy feature of this year is the approval accorded in the month of October 1939 for the sale and demonstration of one of the popular types of mouldboard ploughs made by Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, Coimbatore. These ploughs, known as P.S.G. No. 16-A and 16-B, after extensive tests for the past nearly two years have now been included in the list of implements and machines tested and approved by the department, in the Villagers' Calendar. They are similar in shape and size to Cooper No. 11 and Kirloskar No. 14 and are provided with chilled cast iron and forged steel shares respectively. Their prices are slightly lower than those manufactured by the other two firms. Once again the conservative attitude of the ordinary ryot and his reticence to anything new is in evidence. Although these ploughs are the same as those approved before, they are not purchased widely and the demand is still for Cooper's ploughs which were the first to be approved. However, these will also gradually become popular like the others. P.S.G. No. 10 ploughs which are made by Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, Coimbatore, and which are similar to the Cooper No. 25 and Kirloskar's Gurjar No. 2, are now under final trials in the districts.

A demand for left-hand ploughs having been received from South Kanara, sample ploughs with self-sharpening adjustable bar point shares suitable for the small work animals of the West Coast, were designed and supplied for demonstration. These have been reported to perform satisfactorily and as suitable for the tract. Minor modifications are in progress for cheapening the manufacturing costs.

Much difficulty was experienced in obtaining spares for the Monsoon ploughs manufactured by Messrs. Ransomes, Sims and Jefferies of Ipswich, England, and particularly for the oft needed slip nose share points. The manufacture of spares suitable for this plough has been arranged with Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, so that these implements may not be discarded where they can be rendered serviceable by renewals of the worn out parts.

The large number of spare parts sold through the Agricultural Demonstrators during the year is an indication that the improved ploughs supplied to ryots are being used regularly and not kept idle. Sales of spares have been steady during the last three years. In order that ryots may not find it difficult to obtain such spares at low cost, they are being standardized so that the parts of the same type of implement made by different manufacturers may fit one another correctly.

During the year the total number of approved ploughs sold through the Demonstrators' depots and direct by the firms amounted to 5,839, and compared with the total of 6,896 for the fasli year 1938-39 represents a big drop. It may be attributed

partially to the unsettled conditions and to some extent to the unfavourable seasonal variations. But inasmuch as there is no such steep fall in the demand for spares, it might be concluded that the ploughs sold are well used.

6. *Ridge ploughs*.—The light steel double mouldboard plough designed by this section and approved for production and sale is still in popular demand.

On account of the demand for a larger ridger, the one designed last year with adjustable wings and suitable for wider furrows was altered for fitting an adjustable bar point share and experimented in some of the sugarcane growing areas in the districts and also on the Central Farm. More tests and demonstrations will be conducted with it during the coming season to bring it to perfection.

7. *All-steel expanding cultivator*.—The implement designed last year was tested under various conditions. In hard and heavy working conditions it was observed that the curved spring steel carriers tended to bend and required strengthening. This change in construction has since been carried out and further trials are in progress. On account of war conditions the price of the special quality spring steel required for it has risen abnormally and under the ruling rates there seems to be no near prospect of evolving an efficient and cheap cultivator. The design is however being pursued to bring out an efficient implement to enable local manufacturers to supply the ryots' demands.

8. *Basin listers for bullock power*.—Demonstrations with the twin furrow bullock power basin lister were carried out in the districts of Bellary and Anantapur and also the Agricultural Research Stations at Hagari and Koilpatti. All these trials have reported the working of the appliance as satisfactory both for moisture conservation and prevention of erosion.

9. *Wet land puddling implements*.—The publicity given to this implement by its inclusion in the list of approved implements in the Villagers' Calendar, has brought more enquiries for demonstrations from ryots. To meet the demand, fifteen puddlers were despatched to the districts for propaganda and hire. As a result of the demonstrations on ryots' lands with their own animals, well-to-do farmers are now purchasing them. Initially four puddlers were sold from workshop stocks and all orders are now passed on to Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, who have during the year sold eighteen, bringing the total to twenty-two. Working experience under various conditions has necessitated some more modifications to it as well as lessening of the weight. Instead of six blades only four are now fitted giving greater clearance between successive blades and avoiding adherence of the sticky soil. This change has also slightly lightened the draught.

10. *Green manure trawlers*.—Since its introduction last year as a labour saving implement it is gradually getting popular. Ten trawlers were supplied to the Agricultural Demonstrators for demonstrations and nine sold from our stocks to ryots. Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, who are now manufacturing them have sold twelve, and including this number the total purchased by ryots amounts to twenty-one. Other crude forms of disc trawlers made by local artisans in Chittoor district and round about Aduturai, are also in use. In the former, the implement is of wood and in the latter iron discs are employed.

11. *Groundnut harvesting guntakas*.—Experiments were conducted suitably modifying the bladed guntaka for lifting groundnuts. A small sized curved blade with a pair of piercing points at its ends are used with the implement. With the points and the curved blade, the implement has uniform penetration in the soil, and trials are in progress for determining the proper widths and point sizes consistent with the capacity of the work animals commonly met with in the groundnut growing tracts in South Arcot and other places.

12. *Mechanical seed drills*.—Constructional alterations of a minor nature were carried out improving the belt drive tightening arrangement and also the funnels at the rear of the tyne points to enable the seeds to drop in the bottom of the furrow. Six machines were made for demonstration in the districts by the department and three were sold to ryots after satisfactory demonstrations on their lands. It was not possible to reduce the cost of the drill on account of the increase in the prices of raw materials. All these light type drills sold last year are reported to be working satisfactorily. Incidentally it might be mentioned that this mechanical appliance can also be equally efficiently employed for drilling chemical fertilizers either mixed with the seed or in separate rows beside the lines at the required distance by a simple positional adjustment of the tynes.

An improved type of gorrur having four adjustable points was designed with cup feed hopper and supplied to the Agricultural Demonstrator, Conjeevaram, for drilling paddy. Six of these gorrurs have since been purchased by ryots and this meets the requirements of a cheap, regular and uniform drilling equipment for paddy.

A broadcast sowing appliance based on the principle of the fiddle seed sower used in foreign countries has been designed and is now undergoing preliminary broadcasting trials on the Central Farm. It is cheap, simple to operate and is capable of covering large areas. Some more are being made for trials and demonstrations in the districts. When made in numbers it can be produced at about Rs. 5 each. Uniform and quick distribution are both practicable with this sower and the seed rates can also be varied by a simple adjustment of the passages.

13. *Hand fertilizer distributors*.—The conical funnel shaped hand manure distributor has been altered into a trapezoidal container with a horizontal flat slit opening outwards at the bottom which can be regulated by a hand operated rod. This gives a uniformly wide manure layer and permits of the free outflow of the fertilizer. The distributors supplied last year to the Agricultural Demonstrator, Ootacamund, are all reported to have been sold to potato growers on the hills and a fresh lot of six have again been despatched for demonstration and sale.

14. *Turmeric polishers*.—Further improvements were effected to this machine to increase its efficiency and output. The sides which were of plain sheet iron have now been fitted with expanded metal and wire gauze supported by iron flats. Increased rubbing surface provided by the expanded metal sides has resulted in quicker polishing. It has made the drum lighter in weight and easy to rotate with a full charge of rhizomes. Three new machines were purchased by district officers last year for demonstration. Whereas originally its demand was limited to the chief turmeric centres of this district, the machine has now spread to other districts also where turmeric is grown on a commercial scale. Being of seasonal demand, it is mostly hired to the ryots from the depot stocks. Machine polished turmeric is cleaner and fetches a higher price in the market.

15. *Hand power groundnut decorticators*.—A simple type of hand operated decorticator was obtained from the Agricultural Engineer, Central Provinces, Nagpur. It is called the Chinese Pattern Groundnut Decorticator, and costs Rs. 25. The construction is simple consisting of a slightly elliptical segmental hopper with a grid at the bottom and an oscillating decorticating arm moving radially inside this container and mounted on the sides of the wooden frame work. Prior to this three other makes of hand groundnut decorticators were tested, two foreign makes and one Indian made, and all these have been abandoned on account of excessive cost and heavy strain during operation. This new machine is lightly constructed and requires only normal effort for working. Two women coolies can operate it without fatigue and trials are in progress. For better adaptation to suit different sizes of pods a few improvements have been effected making the shelling device adjustable and with differently spaced change grids.

16. *Rice shellers*.—Considerable attention was directed towards the design of a suitable hand operated machine for producing rice with the bran coat in tact and equivalent to hand-pounded stuff. Nutrition experts appear to favour totally unpolished material in preference even to the partial removal of the outer layers containing proteins and vitamins which might reduce the nutritive value of the rice. It can with the experience gained during the last few years now be said that the Ce.Co.Co. pattern hand sheller is an admirably suitable mechanical device for shelling paddy without the vitamin destroying action of the ordinary combined

power sheller and polisher. So far as this machine is concerned, the laborious part of the operations is the separation of the husk from the rice after the paddy is shelled. To get over this difficulty a fanning mill was designed and experimented with different types of shelled paddy. It is similar to an ordinary winnower and has been simplified for easy operation. In an hour four bags, each of 160 lb. weight can be cleaned. A combination of the hand power sheller with a fanning mill of this type will constitute an efficient unit for the production of unpolished rice as a cottage industry in rural areas. Experiments are in progress to make use of this winnower for cleaning other grains and also for separating shelled groundnut pods.

One of the machines made by Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, has been purchased by the Industrial Engineer to the Government of Mysore and another has been ordered by the Paddy Specialist of the Orissa Government. There has also been a request for its purchase from a leading ryot in Chidambaram. Since the Japanese made machines are not now imported by their agents here, orders for these machines are transferred to the local Industrial Institute at Peelamedu.

17. *Water lifts—Circular mhote*.—A silver medal was awarded by the Imperial Council of Agricultural Research for the improved circular mhote entered in 1938 for the open competition held by them for any outstanding improvements or designs in respect of water lifts. This lift had already been declared an improvement over the indigenous circular mhote of the South Arcot district by the Provincial Agricultural Committee.

Two demonstration lifts were supplied from this section to the Agricultural Demonstrator, Vriddhachalam, and to the Assistant Director of Agriculture, Nellore. The former was erected departmentally on the farm of Sri C. M. Vasudev Singh at Ko-Adanur village and is reported as working satisfactorily. These lifts are now manufactured regularly by the local industrial concern and two lifts made by this firm for sale to ryots through the concerned Agricultural Demonstrators were inspected and approved. In addition three other such lifts were sold direct by the makers to ryots.

Persian wheel water lifts.—Statistical data gathered through the Agricultural Demonstrators showed that up to the end of last year there were approximately 130 Persian wheels working in the province. It is now reported through the same agency that over 40 such water lifts were erected on ryots' wells during this year. Persian wheels made by Messrs. Cooper Engineering Co. of Satara, called "Hindustan rahats" and those manufactured by Messrs. Kirloskar Brothers, Ltd., of Kirloskarvadi, under the name of "Kifayat rahats" are both approved for demonstration to ryots by the department. Having a larger applicable range,

the Persian wheels are in greater demand than the improved circular mhote whose field is limited to areas where the water table is very high.

Two other interesting models of water lifts were also studied. A floating water wheel type, the idea of Mr. Chooet Smith, Survey Officer, Hastampatti, Salem, was examined and this type has a possibility of application for the irrigation of canal banks from irrigation channels. But there has so far been no demand for such a type of water-baling appliance.

The second is the model balancing bucket pump attempted by Sri Peddi Narayanaswami Reddi of Kondipedu village, North Arcot district. It is very doubtful whether this will prove a practical success.

Yet another new model lift is the "Kapila" designed by Mr. Venkataramappa of Brahmasamudram in Anantapur district and estimated to cost Rs. 200. Its utility and efficiency will be investigated to determine how far it can be usefully recommended to others.

18. *Mhote wheels*.—Cast iron mhote wheels provided with either ball or roller bearings have been becoming increasingly popular among ryots both on account of their durability and friction-free operation. Hitherto Messrs. Kirloskar Brothers of Kirloskarvadi and Messrs. P.S.G. & Sons' Charity Industrial Institute, Peelamedu, alone have been manufacturing them. Messrs. Cooper Engineering, Limited, of Satara, also have started making such wheels which have been since approved for demonstration and sale to ryots. These new wheels priced at Rs. 10 have a better finish and rotate more freely than the other two. It reveals a distinct improvement in workmanship recently noticed in a marked manner in all their products.

19. *Pneumatic tyres for bullock-carts*.—Seven years have now elapsed since the first set of pneumatic tyre equipment was fitted for experimentation with bullock-drawn vehicles on farm roads and fields. Facts collected during this period prove beyond doubt the numerous advantages possessed by this change over. Dynamometer records establish conclusively that this equipment requires lesser draught than the ordinary iron tyred wooden wheeled carts and the advantage is more pronounced with heavier loads than under light loads. On ploughed fields and rough surfaces draught again favours the pneumatic equipment and it is also more speedy. The strong factor that still stands prominently against its popular adoption by the ryot of ordinary means is the high initial investment. Where heavy haulage and almost continuous usage are required, there is nothing better suited to bullock-carts than the fitting of the complete pneumatic tyred equipment.

During the year an open double-bullock pneumatic tyred cart was made for the Cotton Specialist and hand-carts for the Government Agricultural Chemist and the Government Mycologist were

also fitted with similar equipment. It is interesting to note that the tyres in these cases perish mostly through age than by wear. An overfit pneumatic tyred equipment for use with ordinary spring bullock-carts has been under experiment for nearly a year on one of the Central Farm vehicles. It has wooden wheels with ball bearing hubs and the pneumatic tyres which fit over the rim are clamped in position. This has so far given satisfaction but is not likely to become popular.

20. *Irrigation pumping plants*.—All the three electrically driven pumping installations worked regularly during the whole year and the supplementary pipe connexion from the four mhote well to the overhead reservoir near the Central Farm yard was utilized for irrigating the old permanent manurials. Their total pumping hours are given below :—

	HOURS.			
4-mhote well plant	..	..	..	2,079
57 well plant	..	..	..	257
60 well plant	..	..	..	686

A structural steel shed was erected at a cost of Rs. 900 for accommodating the oil engine and pump installed in the 'M' block well in the wet lands. This structure now completes the permanency of all the irrigation units on the Central Farm. The total hours of running of the two oil engine driven pumps are given underneath :—

	HOURS.			
5-A Well Blackstone engine	..	..	..	668
"M" Block Hamworthy engine	..	..	..	686

In all the above installations the reduction in the yields of the wells was the main limiting factor for the pumpage and had there been more available supply they would have been worked for longer hours.

21. *Dairy machines*.—A new uptake was obtained from the makers and fitted up to the boiler at an inclusive cost of Rs. 490, and the boiler was put on duty from 21st March 1940. Since then it has worked for 305 hours averaging roughly three hours per day.

New bearings were made for the motor-operated refrigerating plant and the strength of the cooling unit solution was corrected for efficient cooling and freezing.

22. *Propaganda and exhibitions*.—Illustrated posters about implements and machines were supplied to the Central Industrial Museum, Madras, to the Rural Reconstruction Van, Salem, and to the Assistant Director of Agriculture, Pattukkottai.

The section participated in a number of important agricultural exhibitions, the chief of which were the All-India Khadi and Swadeshi Exhibitions at Madras, Calicut and Madura, the Cattle

and Agricultural Show, at Tiruppur, the Central Exhibition held here during the Annual College Day and Conference, and the Tiruvadi Sapthasnanam Exhibition at Tanjore.

23. *Workshops.*—The workshops continued to cater to the research and other sections here in a large measure as also the District Officers in investigating the different problems in addition to making the implements and apparatus needed for their own work. More and more enquiries are being received from the general ryot public for technical guidance and advice regarding implements, water lifts for bullock and power operation, cane crushers, disintegrators, etc., and these in some instances are from outside our province. The total number of work orders executed during the fasli year under report was 412 as against 273 for the corresponding period last year which indicates an increased activity of over 50 per cent.

24. *General.*—It is indeed interesting to observe that some of the implements and machines advocated to ryots by this department are being adopted by a few outside State and Provincial departments. The officers of the Jodhpur and Ajmer States have purchased the bund forming implement for their use. A wet land puddler has been sold to the Government Experimental Farm at Karimganj, Assam. A hand power rice sheller has been purchased by the Industrial Engineer, Mysore, and another ordered by the Paddy Specialist of the Orissa Government. The Burma Agricultural Department has purchased one of our twin-furrow basin listers as also the Superintendent, Dry Farming Research Station, Raichur, Hyderabad State. Ball and roller bearing mhote wheels and bund formers owing their origin to this Presidency are believed to be used in the United Provinces, Bombay and other parts thus making this section useful not only for our own ryots but also in a small way to cultivators outside our province. All the above implements and advice were requisitioned by seeking the help of this section. More gratifying to mention is the increased assistance now sought systematically by the ryots for technical information from this section and acting according to our recommendations.

COIMBATORE,
31st July 1940.

B. M. LAKSHMIPATHY,
Research Engineer.

ADMINISTRATION REPORT OF THE CURATOR, GOVERNMENT BOTANIC GARDENS AND PARKS, OOTACAMUND, FOR THE YEAR 1939-40 (FASLI 1349).

Charge.—I was in charge of the office of the Curator throughout the period under report.

2. *Government Botanic Gardens, Ootacamund*—(a) *Season.*—The total rainfall was 76.76 inches against 41.51 inches last year. There were 151 rainy days against 165 and the heaviest rainfall on a single day was 8.92 inches recorded on the 15th November. Heavy showers were experienced in November when 20.42 inches were recorded. The months of December and January were practically dry when the gardens suffered from scarcity of water.

The maximum and minimum temperatures ranged between 58° and 89°F. and 24° and 55°F. respectively. The highest temperature was recorded during the second week of April and the lowest during the third week of December.

Severe frosts occurred in December and January and did considerable amount of damage to the flower beds and ornamental plants.

(b) *Condition and maintenance of the gardens.*—The gardens were on the whole maintained in good order during the year. They were more frequented by visitors than in former years, which shows that they are becoming more popular.

His Excellency the Governor's Band played, when weather permitted, once a week during the season, and the music thus provided was greatly appreciated by the numerous visitors to the Gardens.

The flower beds and borders in the Band Stand and Fountain terraces were maintained in an excellent condition throughout the year, the display of flowers being at times very effective. The two rockeries in the Band Stand were completely overhauled and replanted with succulents and a few selected annuals. The new Band Stand and also the grass slope below the main drive to the Government House were properly levelled and turfed. This place is now made more useful for picnic parties.

The most important works undertaken during the year were the blasting of the two big rocks below the Public Conservatory and the construction of four new terraces and planting the same with suitable annual flowering plants, and renovating the car park completely. The Aloes and Agaves from the centre of the Car Park were removed and one big oval and four small flower beds were made with steps between the small beds. A plant of

Brahea robusta was planted in the centre of the oval bed. The improvements have considerably increased the beauty of these places.

The lawns were kept neat and tidy by regular attention being paid to the weeding, sweeping and mowing with the lawn mower and in the cold weather they were top dressed with manure and silt obtained from the lake with a view to improving their condition subsequently.

The footpaths which had become much washed out during heavy rains were heightened, realigned and finally gravelled. A considerable amount of labour was expended upon them as usual to maintain them in a decent order.

The precipitious slope at the back of the Band Stand terrace near the newly constructed revetment appeared to be a possible source of danger to children and hence a plain, but neat railing 134 feet in length, was erected in continuation of the existing one up to the lower margin of the slope in question. With the same object in view, similar wooden railings were also erected all round the pond situated in the lower part of the gardens between the entrance and the office.

A considerable amount of attention was devoted to eradicating the worst of the weeds in the Gardens, the most prominent ones being the *Polygonum tomentosum* and the Australian daisy (*Vittadinia australis*).

Other minor improvements effected during the year include the draining of the swampy parts of the lower gardens, the removal of exhausted soil and the substitution of good loam around the roots of specimen trees, the uprooting of decaying trees and their replacement by recently introduced species, the removal of dead-wood and parasite from the trees and a mass of unsightly undergrowth from the slopes, opening of new flower beds and borders and planting standard roses in the centre of the beds, etc. In addition, all the Garden ponds were twice cleared of weeds and once cleaned of silt during the year.

The "Mirror Carps," a valuable brood of fish that grows to a marketable size introduced from Ceylon in January 1939 have already outgrown the small crescent pond in the Botanic Gardens, Ootacamund, and arrangements are being made by the Director of Fisheries, Madras, to have them transferred to the lake in Sim's Park, Coonoor.

(c) *Conservatories*.—The Upper Conservatory was kept as bright as possible with a succession of flowering plants in pots from the nursery glass houses and the Lower Conservatory at the left hand entrance to the Botanic Gardens was filled with Palms, Ferns and other foliage plants. The conservatories always contained something interesting and at most times a number of

choice orchids, Liliiums, Hybrid Primulas, Cinerarias, Phyllocactus, Begonias, Gesneras, etc., were in flower and these are being more and more appreciated by the general public.

(d) *Nursery work*.—The nurseries and the contents of the Glass houses have undergone a thorough overhauling with the result that considerable improvement has been effected in them. A good stock of Pinus, Cupressus and other ornamental Conifers and trees and flower seedlings for distribution was maintained in the nurseries in spite of the great difficulties experienced in obtaining a sufficient supply of water for watering purposes during the dry months of December and January. Visitors to the nurseries were numerous who really appreciated the works that are being undertaken there. In all, 781 packets of seeds were sown and many thousands of plants and seedlings raised.

(c) *Introduction of plants and seeds*.—The 12 plants of *Michelia champaca*, new to the Gardens, obtained from the Government Gardens, Lal Bagh, Bangalore, last year, were planted in different parts of the Gardens. Forty-one Orchids from the Chandra Nursery, Sikkim State, 66 bulbous plants, such as Amaryllis, Eurycles and Kaempferia from Sri K. S. Gopalaswami Ayyangar, nurseryman, Bangalore, 38 lily bulbs in different varieties from Messrs. Ghose & Co., Darjeeling, 8 plants of *Araucaria cookii* from the Agri-Horticultural Society's Gardens, Madras, and 46 Achimenes bulbs from Messrs. Pocha & Sons, Poona, were added to the garden collection by purchase. In addition, 499 packets of flower seeds were imported on payment for the requirements of the garden and conservatory. 50 Madonna Lily bulbs were also received on exchange account from Messrs. Fritsch & Co., Coonoor.

Besides the above, 791 seedlings of different kinds and 38 packets of seeds from different gardens and private individuals were received as a contribution to the gardens including the 20 packets of seeds obtained from the Royal Horticultural Society, London, and presented by me, from which several new species of trees and shrubs have been raised.

The large flowered Cannas in 31 varieties obtained from Messrs. Pocha & Sons, Poona, last year, did fairly well out of doors, but the climate is rather too vigorous for them. The flowers get spoiled by the cold wind and rain, while during the cold weather both flowers and leaves are usually much injured by frost. They, however, do well under the protection of a glass house; while at Coonoor, where the climate is much milder, they thrive and flower to perfection out of doors.

(f) *Distribution of plants and seeds*.—One thousand and one hundred and eleven trees and shrubs, 6,796 seedlings, 293 cuttings, 50 bulbs and bulbous plants, 33 lb. of tree seeds and 60 packets of flower seeds were sold. Nineteen plants, 550 seedlings

and 5 packets of seeds were supplied gratis or in exchange. Botanical specimens were also supplied gratis to three colleges and private individuals for class work and examination.

(g) *Plant breeding*.—An attempt was made to cross *Lilium longiflorum* with *Lilium regale*, but without success. *Primula obconica* varieties were successfully cross-fertilized and seeds collected and sown under glass. The hybrid *Phyllocactus* has just started flowering and attempts will be made to cross-fertilize them.

(h) *Medicinal plants*.—Two hundred and thirty pounds of *Ipomoea purga* (Jalap) tubers were planted in March in the medicinal garden in 5 cents of land after applying cattle manure at the rate of 10 tons per acre. The growth is satisfactory.

Seedlings of *Pyrethrum* (*Chrysanthemum coccineum*) and (*Chrysanthemum cinerariaefolium*) were planted in different parts of the Gardens and are thriving well. Seeds of both the varieties will be collected for further propagation purposes.

Out of 600 seedlings raised from 1 ounce of seeds of *Pyrethrum* received from Dalmatia (Yugoslavia) through the Imperial Council of Agricultural Research, 550 seedlings were sent to the Agricultural Research Station, Nanjanad, for trial.

Out of 12 plants of *Lobelia inflata* mentioned in last year's report, only three plants are surviving. There are at present only three plants of *Barosma betulina* out of 72 seedlings raised last year. As the trials of the above two medicinal plants are not successful, the cultivation of the same will be discontinued.

Castor trials.—Two trial plots measuring 100 feet by 10 feet and 72 feet by 10 feet laid down by the Assistant to the Oil Seeds Specialist were sown with castor seeds of 11 strains. The germination was fairly good and the failures were resown. The growth of the plants is on the whole satisfactory.

3. (i) *Public Parks, Ootacamund*.—These scattered pieces of lands were kept in the usual order, much of the time of the small staff employed being taken up in weeding, tree pruning, hedge clipping, cleaning, etc.

The right of grazing in the Parks was sold in public auction regularly once in three months, with effect from the quarter ending 31st December 1939 and the total revenue realized thereon amounted to Rs. 634-8-0 during the year. The illicit grazing of cattle was greatly minimized by the above auction sales and only 108 head of cattle were impounded during the year.

The receipts by the sale of old and dangerous trees, etc., removed from the Parks amounted to Rs. 381-12-0.

(ii) *Secretariat Garden in the Stonehouse Hill*.—The flower beds and borders were kept in good condition. Over 3,500 seedlings were supplied from the Botanic Gardens, Ootacamund, free of cost, for furnishing the flower beds and borders.

The control of the Stonehouse Hill grounds and the Secretariat Gardens was transferred to the Park Sergeant as per G.O. Ms. No. 1408, Development, dated 15th June 1940.

4. *Sim's Park, Coonoor*—(a) *Season*.—The total rainfall was 58.39 inches against 75.84 the previous year. There were 141 rainy days against 153 last year and the heaviest fall occurred on the 17th October when 4.65 inches were received. The wettest month was October during which 13.61 inches were recorded and the driest month was January with only 0.20 inch of rain.

The maximum and minimum temperatures ranged between 85° and 62°F. and 39° and 65°F. respectively, the highest having been recorded on the 30th May and the lowest on the 16th January.

(b) *Condition and maintenance of the Park*.—This naturally prettily situated Park continues to be as popular a resort as ever for the inhabitants of, and visitors to, Coonoor and Wellington. The usual upkeep was attended to with the result that the Park was kept in good order during the year.

Special attention was paid to the numerous flower beds and herbaceous borders which were always kept filled with suitable annuals and perennials and other bulbous plants. Of the permanent improvements undertaken during the year were the planting of three live *Abelia* hedges, one all along the lake margin to a length of 180 yards, another in place of the old *Hakea* fence to a length of 50 yards by the side of the main entrance to the Park and the third over a distance of 35 yards along the road in front of the Agricultural Show Rooms. Two hedges, one of *Spiraea peruviana* to a length of 30 yards from the hair-pin bend of the rest-house road and the other of *Agave*, 35 yards in length along the boundary of the Park above the Wild Garden, were also planted and all the gaps in the other Park hedges were filled in with *Frenela rhomboides* seedlings. The large Island bed was considerably improved by erecting a rustic arch with two seats. The central flower bed was reshaped and a Canna bed, 6 feet wide was opened with a grass border all round the island. The different varieties of Cannas now in flower are putting up a beautiful show. The small Island also was similarly improved by opening a Canna bed with Iris border. As the Cannas do very well at the Park, a long bed of 56 yards was newly made at the end of the first terrace and planted with different varieties of Cannas. Three new rockeries were also made and planted with suitable succulents and rock plants. Two manure pits (15 feet by 12 feet by 5 feet and 20 feet by 12 feet by 5 feet) were dug near the Pot shola for the preparation of compost.

Besides the above, the usual works such as cleaning the lake, top-dressing the lawns, repairing the footpaths damaged during heavy rains, opening of new flower beds, etc., overhauling the rockeries and replanting them, etc., were attended to.

The garden seats and Summer houses were as usual repaired and painted and the labelling of plants in the different parts of the Park received attention.

(c) *Nursery work*.—The small nursery attached to the Park was always kept filled with young trees, shrubs and herbaceous plants which were propagated in large numbers to supply the Park requirements and for sale. Two new terraces were made in the nursery and planted with 200 standard rose cuttings. Twenty beds were bordered with either *Alternanthera* or *Iris*. Special attention was paid to the budding of roses in the rose nursery attached to the Agricultural Show Rooms and in all 100 buddings were done. A few new varieties of roses also have been budded.

Two manure pits measuring 18 feet by 12 feet by 5 feet and 12 feet by 12 feet by 5 feet were newly opened in the Nursery for making compost.

(d) *Introduction of plants and seeds*.—Three plants of *Araucaria Cookii* obtained from the Agri-Horticultural Society's Gardens, Madras, were planted in different parts of the Park. The plants of *Michelia Champaca* and the nine new varieties of roses planted last year are growing satisfactorily. The other plants introduced were mostly succulents.

Alcurites Fordii (Tung).—Out of the existing five trees in the Park, the tallest one is 11½ feet in height and 6½ inches in girth at 4 feet from the ground. None of the trees have flowered during the year, and their growth is considerably slow.

(c) *Distribution of plants and seeds*.—Six hundred and eighty nine flower plants and shrubs, 21 standard roses, 37 packets of flower seeds and 5 lb. and 5 oz. of tree seeds were sold during the year. Besides this, 20 lb. of tree seeds were collected for sale to the public at the Botanic Gardens, Ootacamund.

5. *General*—(i) *Exhibitions*.—As usual the foliage and rock plants were exhibited at the Flower Show of the Nilgiri Agri-Horticultural Society, held at Ootacamund, in May 1940, and this was much appreciated by the public.

(ii) *New works and repairs*.—No new works were undertaken during the year except the re-roofing of the Glass House No. I by the Public Works Department.

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.

(iii) *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. 121-14-0 against Rs. 195-2-0 in the previous year.

(iv) *Agricultural Show Rooms, Coonoor*.—The Show Rooms at Coonoor were open to the public throughout the year and a considerable amount of produce was sold there.

(v) *Visitors*.—Among several who visited the Gardens, mention may be made of Sri P. S. Rao, I.C.S., Sri S. V. Ramamurti, I.C.S., The Maharajah of Pithapuram, Mrs. E. Bennett, Ootacamund, Dr. Bhiladuala, Bombay, Sri Rama Varma of Cochin Palace, Coonoor, The Director of Agriculture, Madras, M. A. Khan, Esq., Hyderabad, H. S. Hussian, M.L.A., Madras and Lieut.-Col. K. R. K. Ayyangar, Coonoor.

6. *Pomological Station, Coonoor*.—(i) The total rainfall was 58.39 inches against 67.29 inches last year. The rainfall was well distributed, but severe drought was experienced during the months of December to March which was responsible for delaying the flowering of plums and causing considerable shedding of young fruits.

(ii) *Planting operations*.—Forty-seven home grafted plums and pears and 20 fruit seedlings consisting of Cherimoyer, Surinam cherry, Lemon and tree tomato were planted during the year.

(iii) *Crops*.—The total yield of fruits of all kinds was 6,129 lb. The crop of apples, plums, grape-fruit, persimmon and other miscellaneous fruits was fairly good during the year.

(iv) *Nursery work*.—One thousand one hundred and eighteen apples, peaches, pears, etc., and 85 oranges and grape-fruits were successfully budded or grafted during the year; besides 1,078 seedlings and plants such as, apples, plums, peaches, cherimoyer, country pear, country lime, fig, etc., were raised.

During the year, 531 fruit grafts and 222 seedlings consisting of apples, pears, peaches, plums, etc., were distributed.

7. *Burliar Fruit Station*.—(i) The total rainfall for the year was 48.48 inches against 43.99 inches the previous year. The months of July and December and January to March were practically dry and in consequence the plant life suffered considerably.

(ii) *Planting operations*.—Three seedlings of Surinam cherry raised from seeds obtained from the U.S.A. Department of Agriculture, Washington, D.C. and three plants of *Ilex paraguayensis* (Yerba Mate) were planted in suitable parts of the garden.

(iii) *Crops*.—The total yield of fruits and spices amounted to 5,702 lb. and 255 lb. respectively.

(iv) *Nursery work*.—One thousand five hundred and five seedlings consisting of clove, mangosteen, litchi, durian, langsat, breadfruit, etc., were raised during the year.

Three hundred and twenty-one grafts and seedlings, 1,095 economic and four ornamental plants were distributed during the year.

8. *Kallar Fruit Station*.—(i) The total rainfall for the year was 49.05 inches against 38.08 inches last year. The rainfall was poor during the month of July and the months of January to March were practically dry.

(ii) *Planting operations*.—Seventy-three fruit grafts and seedlings such as, Batavian orange, Surinam cherry, grape-fruit, Rambutan, Cherimoyer, Bullock's heart, Sour sop, etc., were planted in different parts of the garden.

(iii) *Crops*.—Six thousand two hundred pounds of fruits of all kinds were harvested during the year under report.

(iv) *Nursery work*.—Six thousand two hundred and fifty fruit plants consisting of orange, loose and tight jacket, sapota, mangosteen, rambutan, litchi, custard apple, lemon, Bullock's heart, clove, etc., were raised during the year.

Four thousand and thirty fruit grafts, seedlings and economic plants, 200 rooted cuttings and $\frac{1}{4}$ oz. of seeds of *Cephaelis ipecacuanha* and 3 oz. of fruit tree seeds were distributed during the year.

9. *Agricultural Research Station, Nanjanad*.—(i) The total rainfall recorded was 51.46 inches on 135 days which was just below the average for the past 22 years. Both the monsoons were favourable to the potato crop.

(ii) *Potato*.—As usual, three crops were grown; the main crop over 9.59 acres; the second crop over 10.62 acres and the irrigated crop over 4.66 acres. They gave 693, 467, and 579 maunds respectively per acre. (1 maund : 25 lb.)

(iii) *Samai*.—15.4 acres were grown under this crop. The germination was fair, but the stand and vigour of the crop were very poor. The crop was severely affected by frost during the ripening stage, resulting in the poor setting of grain and low yield. The average yield of grain and straw worked out to 290 and 905 lb. respectively per acre. Due to the high cost of cultivation, it is proposed to give up this crop in coming years and to grow instead resistance oats which gives good yield and fodder for cattle.

(iv) *Resistance oats*.—2.15 acres were sown and gave an acre yield of 677 lb. of grain and 3,670 lb. of straw. The crop had a very good rank vegetative growth, but there was a severe attack of rust. The low yield of grain may be due to the rank growth and the grains not filling in properly. The crop grows quickly during the wet weather, smothering the weeds unlike samai. As the straw is very much relished by cattle, the area under this crop will be increased.

(v) *Trial crops—Pyrethrum*.—A small quantity of this seed was sown but the germination was very poor and there are only five seedlings at present, from which flowers are being collected. It is proposed to increase the area under this crop.

Tephrosia vogellii.—The germination was good, but the plants were cut down by frost. After the showers in April, some plants came up and they are now in good growth.

Castor.—Seven castor types received from the Oil-Seeds Specialist were sown and all germinated very well. The growth of the plants is rather slow.

Virginian tobacco.—The seedlings raised on the farm were transplanted during November. The plants established well, but were badly affected by frost. This year the seedlings were transplanted in June and they have just established.

Berseem.—This was sown in a small area for trial. The seed was inoculated with Berseem culture received from the Government Agricultural Chemist and the crop gave an acre yield of 6,700 lb. of fodder in one cutting.

Backwheat and Rye.—These were grown successfully. Rye is found to be a good substitute for wheat and seed has been supplied this year for trial in the three sub-circles of the Nilgiris district.

Lupinus angustifolius.—This could be grown successfully and seed can be fed to cattle. This is a good green manure crop also. As an experimental measure, lupin was fed to a pair of animals and no harmful effects were noticed.

Sunn hemp, kolinji and Sudan grass were failures.

Punjab barley was sown by the side of local barley and it was badly attacked with rust as well as smut.

Pusa types of wheat and Aberystwyth Winter Oats S. 147, chillies, garlic, etc., were tried during the year under report.

(vi) *Seed distribution*.—During the year, 4,352 maunds of seed potatoes, 1,264 lb. of barley, 31 lb. of rye, 109½ lb. *Lupinus angustifolius*, 117 lb. of blue lupins and 3,250 "Kikuyu" grass setts were supplied from the station.

(vii) *Petty construction and repairs*.—Improvements and annual repairs to the non-residential buildings and farm road were carried out during the year at a cost of Rs. 1,630.

P. A. NATHAN,

Curator, Government Botanic Gardens and Parks.

OOTACAMUND,
31st July 1940.

ADMINISTRATION REPORT OF THE PROVINCIAL
MARKETING OFFICER, MADRAS, FOR THE YEAR
1939-40 (FASLI 1349).

I submit herewith my administration report for the year 1939-40 (fasli 1349).

2. *Charge.*—I continued in charge of the section throughout the year except for the period of leave from 21st June 1939 to 17th August 1939 when Assistant Marketing Officer, Sri K. W. Chakrapani Marar, was in additional charge. There was no change in the four posts of Assistant Marketing Officers. The four Agricultural Marketing Assistants of the Upper Subordinate grade sanctioned temporarily for one year in G.O. Ms. No. 801, Development, dated 30th March 1939, joined duty in May 1939. In G.O. Ms. No. 1666, Development, dated 3rd July 1939, the post of the Provincial Marketing Officer was made permanent with effect from 1st August 1939.

3. *Marketing surveys.*—During the year, the final market survey reports on lac and jute were completed and forwarded to the Agricultural Marketing Adviser to the Government of India, Delhi, the Director of Agriculture, Madras, and the Government. An advance copy of the 'Supply and Demand' and 'Utilization' chapters on the marketing survey of sugar in the Presidency was sent to the Agricultural Marketing Adviser to the Government of India, Delhi. After the publication of the report of the All-India marketing survey of tobacco in November 1938, the provincial report which was completed in 1936 was revised and the statistics brought up to date in November 1939 and submitted to the Director of Agriculture for publication. The surveys on maize, Bengalgram, cashewnuts, sugars, fish and prawns were continued and the reports are under compilation. Up-to-date statistics and supplementary information were also furnished to the Agricultural Marketing Adviser to the Government of India, Delhi, on the several survey reports already submitted and which are being compiled by the Central Marketing Staff. A special investigation of the trade in lacquer toys at Ettikoppaka (Vizagapatam district) was made and a report sent to the Government.

4. *Development work.*—In addition to the survey work, considerable amount of development work was carried out during the year. The appointment of four Agricultural Marketing Assistants in May 1939 made it possible to take up more intensive development work and considerable progress was made during the year under report. The services of the Marketing Staff are now being more and more requisitioned by the public, co-operative societies, the trade and all other agencies interested in marketing. A brief abstract of the development work done in the year is given below.

5. *Grading of agricultural commodities.*—One of the main defects of the present methods of marketing agricultural commodities is the absence of any standard type or quality of produce. Consequently there is no basis for price quotations. Although grading of commodities is beneficial to the growers, merchants and consumers in various ways, systematic grading has not been so far adopted in this Presidency. If the Agricultural Produce (Grading and Marking) Act enacted by the Government of India in 1937 is properly utilized, it will have far reaching effects in the course of time in the economic development of the country. For work connected with the fixation of grade standards, 64 samples of rice, paddy, ghee, coffee and groundnuts were collected and sent to the respective officers and commercial firms; the total number of samples sent so far including those of the previous years is 1,682. The grade specifications when accepted and adopted by the Agricultural Marketing Adviser to the Government of India, Delhi, are published as schedule to the Agricultural Produce (Grading and Marking) Act. In order to familiarize the merchants, producers and consumers regarding grades, quality characteristics of the commodities and the benefits of sale and purchase on well defined grades, a few experimental grading stations were started in 1938-39 for eggs at Ongole, rice at Kuttalam and Nellore, Sathgudi oranges at Madras and mangoes at Chittoor. As the results of these experiments were encouraging, this line of work was extended during the year to include the following commodities:—

Commodity.	Types or varieties.
Rice	White Sirumani, Red Sirumani, Korangu Samba, Nellore Samba, Kusuma, Atragada, Delhi Bhogam, G.E.B. 24, Molakolukulu.
Oranges	Sathgudi, Wynaad (Coorg).
Mangoes	Bangalora, Neelam, Malgoa, Peter, Mundappa, Khadar, Ruman, Banganapalle.
Pineapples	Kew, Mauritius.
Eggs	Hen, Duck.
Potatoes	Great scot.
Cane Jaggery .. .. .	....
Tobacco	Virginia, Nattu.

In fixing grade standards, the special quality characteristics of each commodity are taken into consideration. Thus tobacco is graded according to the colour and texture of the leaf and there are five grades of Virginia flue cured, three for sun cured and five for Nattu tobacco. Rice varieties have three grades each, special, A and B, and these grades are based on the degree to which blemishes like dirt, broken grains, foreign matter and the presence of weevilled, damaged and discoloured grains. Oranges, limes and potatoes are graded according to the size and mangoes and pineapples by weight. Cane jaggery is graded according to colour and texture. Hen eggs are graded into six grades—extra special, special, A, B, C and D—minimum weight of the eggs under each grade being 2 oz., 1-7/8 oz., 1 1/4 oz., 1 1/2 oz., 1 3/4 oz., 1 1/2 oz. and below respectively.

Grade standards have also been fixed for hides and skins, lime juice, cordial and squash, edible oils and edible groundnuts. Owing to various difficulties in fixing suitable standards for ghee in this

Presidency, it was not possible to start ghee grading stations, though some of the merchants at Tiruppur, Guntur and Ellore were agreeable to start grading of ghee.

A number of Co-operative Associations and individual merchants in various parts of the Presidency have been authorized to grade their produce and mark the packages with 'Agmark' seal and label.

The statement below shows the progress of grading work during the year :—

Grading Stations.

Commodity.	Place of grading.	Date of commencement.	Number of authorized packers.	Quantity graded.			Units.	Value of produce graded.	
				Beginning of year 1939.	Year ending 30th June 1940.	Up to the end of 30th June 1939.		Up to the end of 30th June 1939.	Graded in the year under report (Cash 1939).
Rice	Nellore	9th April 1939.	11	Experimental period.	7,894	81,113	89,007 Maunds.	RS. 40,990	RS. 3,61,061
	Kuttalam	15th February 1939.	6	Do.	18,328	84,742	53,170 "	65,000	1,44,018
	Koradacheri	6th March 1940.	3	....	..	4,727	4,727 "	..	18,960
	Tenali	Do.	1	....	..	5,471	5,471 "	..	23,155
	Gudivada	3rd April 1940.	1	....	..	280	280 "	..	1,200
	Trichinopoly	6th March 1940.	3	....	..	634	634 "	..	2,546
	* Chidambaram.	....	5	....	..	..	..	..	..
Eggs	Ongole	1st April 1938.	1	1	305,749	161,824	467,573 Numbers.	5,140	3,014
	Madras	1st July 1939.	1	....	..	304,842	304,842 "	..	7,090
	Tirur	6th November 1939.	1	....	..	29,481	29,481 "	..	450
Oranges	Madras	1st May 1939..	1	Experimental period.	610	15,451	16,061 Baskets (50 each).	1,885	36,580
Mangoes	Chittoor	10th June 1939.	1	Do.	3,826	6,060	9,886 "	4,522	7,823
Potatoes	Metupalayam.	6th November 1939.	3	....	..	8,729	8,729 Maunds.	..	26,993
Jaggery	Coimbatore	14th April 1940.	1	....	..	1,902	1,902 "	..	6,925
	* Vellore	....	1	....	..	..	..	..	..
	Total	..	..	..	..	..	..	1,16,347	6,39,315
									7,55,662

* Grading has not yet started. Preliminary work was done to commence grading early in July.

6. *Marketing by co-operative societies*—(a) *Paddy*.—The district of Tanjore exports annually over a lakh of tons of paddy and about 75,000 tons of rice valued over 1.5 crores of rupees. For various reasons, the work of the Central Marketing Society, Tanjore, did not come up to expectations. The Directors of the Central Society and the various sale societies affiliated to the Central Society were frequently visited and urged to undertake joint sale of the produce of the members in Coimbatore, Pudukkottai, Madura and Ramnad districts. The following shows the progress of work of the paddy sale societies in Tanjore district :—

(1)	Quantity sold. Imperial maunds.	Estimated value.	To whom sold.	
			(3)	(4)
		RS.		
Nidamangalam Sale Society	1,455	3,880	Co-operative	Store,
Do.	120	320	Madura.	
Do.	300	800	Pudukkottai.	
Kumbakonam Sale Society,	1,192	3,180	Co-operative	Society,
Kuthanoor.			Karur.	
Cauvery Delta Sale Society	300	800	Madura Stores.	
			Co-operative	Sale
			Society, Erode.	

Recently, there was a conference of the Mirasdars of Tanjore district at Mannargudi for accelerating the progress of marketing work and it was decided to start paddy marketing societies at Kumbakonam, Mannargudi and Trichinopoly with branches, if necessary, to federate all these into a Central Organization at Tanjore which would deal with markets outside the district.

(b) *Plantains*.—Necessary help was rendered to the Vangal Co-operative Society (Trichinopoly district) in the marketing of plantains. The society worked at a profit and the members were able to realize better prices for their produce. Arrangements have been made to extend the area of operation and to register a new society to include all the plantain tracts in the Cauvery delta, viz., the taluks of Karur, Musiri, Kulittalai and Namakkal.

(c) *Sugarcane*.—A society for the growers of sugarcane at Kattuputhur was formed with the area of operation extending over the taluks of Karur, Musiri, Kulittalai and Namakkal to help the members in marketing their sugarcane and jaggery at favourable prices. The society is negotiating with the sugar factory at Pugalur with regard to the disposal of sugarcane.

(d) *Fruit Marketing Societies*.—(i) A Fruit Growers' Society was organized at Tenali (Guntur district) to market the limes and oranges of the members to the best advantage. The society has been marketing limes at Calcutta from May 1940. The Agricultural Marketing Adviser to the Government of India, Delhi, has also recently authorized the society to grade the limes under the Agricultural Produce (Grading and Marking) Rules. It is proposed to commence grading in the ensuing season.

(ii) The South Kanara Fruit Growers' Society and the North Malabar Fruit Growers' Co-operative Marketing Society received assistance as regards grading and marketing of pineapples.

(iii) Arrangements for grading the produce of the Wynaad Fruit Growers' Co-operative Marketing Society were completed. Grading will commence in the ensuing season.

(iv) The Koduru Fruit Growers' Co-operative Society marketed increasing quantities of Sathgudi oranges at Madras. The Provincial Marketing Society could not dispose of the entire produce in Madras itself. Sales were therefore arranged in mofussil centres like Madura, Trichinopoly, etc., through local co-operative sale societies and other agencies. Grading of oranges on 'Agmark' basis greatly facilitated the profitable marketing of sathgudi oranges. The F.W. Grader was working throughout the main season from 3rd June 1939 to the middle of May 1940, and 15,451 baskets of oranges valued at about Rs. 37,000 were graded during the period. The grading of sathgudi oranges is almost well established now, and dealers and consumers in the mofussil markets are demanding graded oranges.

(v) *Chittoor Fruit Growers' Society.*—During the year, a mango growers' co-operative marketing society was organized at Chittoor. The society sent graded fruits to Bombay and all important towns in South India. The prices fetched were quite favourable to the growers, and despatches to Bombay and southern markets are on the increase.

(vi) *Potato marketing.*—The Nilgiris District Co-operative Marketing Society marketed during the year graded potatoes under 'Agmark' grades. For the first time, the society sent during the year consignments of potatoes to Bombay and Calcutta markets with favourable results. The Marketing Officers, Bombay and Bengal, rendered help in the disposal of the produce to the best advantage.

(vii) *Marketing of jaggery.*—The Coimbatore Taluk Co-operative Marketing Society commenced operations in July 1939 and from its inception close contact was maintained and advice rendered on their marketing problems. The society was put in touch with the Malabar Co-operative Marketing Society for marketing cane jaggery, as Malabar is the main market for Coimbatore jaggery. The society intends opening sale depots in Palghat and other places and grade the jaggery on 'Agmark' basis.

(viii) *Egg Marketing Society, Ongole.*—The Society continued to market graded eggs under "Agmark." During the year under report, 161,824 eggs valued at Rs. 3,014 were marketed at Madras and other markets.

7. *Assistance to the Co-operative Department.*—It will be seen from the foregoing that all possible assistance was rendered to various co-operative societies in the marketing of their main produce like paddy, rice, oranges, pineapples, mangoes, eggs and potatoes. Assistance was rendered in organization of fruit growers'

societies, milk unions and marketing societies. Written and oral evidence was given before the Committee on Co-operation about the need for special marketing societies and as to the manner in which the present co-operative loan and sale societies could be reorganized to undertake marketing work. A comprehensive note on the present marketing methods of major crops in the Presidency, the wastage that occurs, the middlemen's profits and how these can be remedied was also prepared and furnished for incorporation in the report of the Committee on Co-operation.

8. *The Commercial Crops Markets Act.*—During the year, the Commercial Crops Markets Act was enforced in respect of cotton in Nandyal and Adoni markets. Partly due to delay in the appointment of Secretary and staff, the market committees could not do much work. Suitable sites for market yards were also not available. Of the market committees started in the previous year, the South Arcot Groundnut Market Committee opened during the year five market yards at Tindivanam, Vriddhachalam, Tirukkoyilur, Ulundurpet and Cuddalore. The Guntur Tobacco Market Committee could open market yards at Guntur, Mangalagiri, Ongole, Chilakalurpet and Bezwada only at the fag end of the market season. The Bezwada taluk of Kistna district was excluded from the originally notified area of Guntur district and Bezwada taluk of Kistna district, and a separate committee was constituted for Bezwada taluk. The enforcement of the Commercial Crops Markets Act in respect of groundnut, tobacco and cotton in a number of centres has been exacting considerable attention of the marketing staff.

9. *Other legislative measures.*—A draft bill for the control of transport and sale of coffee husk was submitted. Proposals were also submitted for necessary legislation to control quality of Virginia tobacco exported from Guntur district.

10. *Market intelligence.*—The supply of market intelligence to producers, merchants, co-operative societies, traders' associations and departments of Government formed another important work of the Marketing Section. About 150 major enquiries were attended to during the year. Weekly reports of the cattle market at Tiruvottiyur showing the arrivals, sales, stocks and trend of prices of cattle are being published in the local dailies. As a war measure, a weekly review of prices of agricultural commodities and market conditions in the Presidency was being sent to the Agricultural Marketing Adviser to the Government of India, Delhi, and the Madras Government till 18th March 1940. It is now prepared by the Director of Industries and Commerce as ordered by the Government.

11. *Transport facilities and reduction of railway freight.*—The provision of refrigerated or insulated vans on the railways for the transport of perishables was being urged for a long time. This was again put up as part of a scheme to have fish freezing stations in important fishing centres in the West Coast and provide cold

storage facilities in the larger consuming centres. The main scheme of freezing stations for fish had to be dropped due to the war. The South Indian Railway have, however, been able to provide an insulated van for the transport of wet fish from the West Coast to Madras. This is a great improvement. The insulated van is 27 feet 6 inches in length and is divided into three compartments. Its carrying capacity is 9 tons. The van is insulated with cork. The temperature inside the insulated van as compared with that in an ordinary van will be about 15°F. less. It is proposed to use this van in the first instance for the conveyance of iced fish. Fish is now despatched from the West Coast stations packed in boxes with ice and this kind of packing will still be necessary. No extra charge will be levied for transport by the insulated van. The matter is being given wide publicity by the Marketing Staff and the Railway Development Staff.

The Marketing Section has also been in frequent touch with the Commercial Officers of the Madras and Southern Mahratta and South Indian Railways in order to bring about reduction in railway freight rates for various commodities. The following statement shows the concessions obtained during the year:—

Name of commodity.	Despatching station.	Destination.	Extent of concession.
1 Plantains ..	Stations in the Cauvery Valley like Trichinopoly, Perugamani, Lalapet, Mayanoor, Pugalur, Karur and Erode.	Delhi	50 per cent.
2 Pineapple ..	Stations in the West Coast like Tirur, Calicut, Tellicherry and Cannanore.	Bombay, Howrah.	From half to one-third parcel rate.
3 Limes and lemons in bags.	Kilakadayam	Kottarakara, Quilon, Trivandrum, Tinnevely, Tuticorin and Madura junction.	15 to 27 per cent reduction by goods.
4 Do. ..	Do.	Trichinopoly, Cuddalore, Madras, Coimbatore, Calicut, Cannanore, Tellicherry and Mangalore.	From half to quarter parcel rate.
5 Potatoes ..	From stations on the Nilgiris between Coonoor and Ootacamund.	Mettupalaiyam and via Mettupalaiyam.	At one anna a maund.
6 Ice	Calicut, Ernakulam, Coimbatore and Mangalore.	To important fishing centres in the West Coast like Tirur, Tanur, Pantalayani, Kasargod, Mangalore, Badagara, Palayangadi, Cannanore, etc.	From half to quarter parcel rate.

Name of commodity.	Despatching station.	Destination.	Extent of concession.
*7 Eggs in improved egg containers.	Tirur, Quilon, Kottarakara, Ongole and Tanguturu.	Madras	Half to one-third parcel rate.
*8 Do. ..	Ernakulam	Do.	At Rs. 1-9-0 per maund instead of half parcel rate.
*9 Do. ..	Katpadi	Kodaikanal ..	From Rs. 2-3-0 a maund to one-third parcel rate.
10 Egg containers.	....	....	* Return empties at one-sixth parcel rate.
11 Dry cattle and calf.	Madras	To stations in the Ongole breeding tract on Madras-Calcutta line.	From 4 annas to 2 annas per mile per wagon.
12 Rice and paddy.	Stations between— (1) Shiyali and Ayyampet. (2) Saliyamangalam and Tiruvarur. (3) Mayavaram and Mutupet. (4) Stations on Nidamangalam-Mannargudi Branch. (5) Mayavaram-Tranquebar, Peralam-Karaikal branches.		
		Pollachi	At annas a maund.
13 Cumblies ..	Hiudupur	Shalimar	From Rs. 3-15-3 to Rs. 2 a maund.
Do. ..	Do.	Via Shalimar and via Waltair.	From Rs. 3-14-7 to Rs. 2 a maund.

12. *The Provincial Marketing Board.*—Pending orders of the Government on the proposals sent for the reconstitution of the Provincial Marketing Board with more non-official members to represent the producers and traders, no meeting of the Board was held in the year. The Board as reconstituted now consists of five officials and five non-officials, the Director of Agriculture being the Chairman and the Provincial Marketing Officer the Secretary. The first meeting of the reconstituted Board was held in July 1940.

13. *The Agricultural Statistics Committee.*—Four meetings of the above Committee were held in the year. In the first meeting

held in July a scheme for an enquiry into the cost of cultivation of the money crops was drawn up and submitted to the Director of Agriculture. In the second and third meetings held in November, the results of the crop cutting experiments to estimate the normal yield of crops were considered. At the meeting held in December, the Committee examined the scheme proposed by the Special Committee of the Indian Central Cotton Committee on crop cutting experiments on cotton, and a report submitted to the Director of Agriculture, Madras.

14. *Conferences, meetings, etc.*—I attended the Marketing Officers' Conference at Delhi in October 1939 and the Mirasdars' Conference at Mannargudi in June 1940. Two meetings of the South Indian Railway Advisory Board and one of the Madras and Southern Mahratta Railway Advisory Board were attended by me. Two general body meetings of the South Arcot Groundnut Market Committee and one each of Adoni and Nandyal Market Committees were also attended. The Third Annual Meeting of the Provincial Co-operative Marketing Society and the General Body Meeting of the Madras Industries' Association were attended. In January 1940, I attended a meeting of the members of the Coimbatore Sugarcane Growers' Co-operative Union and the Coimbatore Marketing Society presided over by Sir T. Vijayaraghavacharya and explained to the members better methods of marketing jaggery and the necessity for developing sugar industry in the district. Attempts are now being made by influential ryots of the district to establish a sugar factory in Coimbatore district. The Provincial Marketing Officer, the Assistant Marketing Officers and the Agricultural Marketing Assistant at Madras made frequent visits to the Provincial Marketing Society and tendered advice as regards the marketing of the society's produce. Assistant Marketing Officer, Sri K. W. Chakrapani Marar, nominated member of the South Arcot Groundnut Market Committee, and Assistant Marketing Officer, Sri S. N. Venkataramana Ayyar, nominated member of the Tobacco Market Committees, Guntur and Bezwada, attended the monthly meetings of the Committees, and rendered considerable assistance to the respective committees in drawing up the by-laws and explaining the provisions of the Act and the Rules.

15. *Exhibitions.*—The Marketing Section took part in the All-India Khadi and Swadeshi Exhibition at Madras and the Agricultural Exhibition at Vuyyuru. A number of graded samples of rice, oranges and eggs and charts were exhibited and the methods and advantages of marketing agricultural produce on well defined grades were explained to the visitors.

16. *Publications.*—A note on the grading of mangoes in Chittoor district was published in the local dailies.

17. *Financial statement.*—The following shows the budget allotment and the amount expended in the year 1939-40 (from 1st

July 1939 to 30th June 1940) from the funds provided by the Imperial Council of Agricultural Research :—

I. Expenditure.

Head of account.	Budget provision, 1939-40.	Expenditure, 1939-40 (1st July 1939 to 31st March 1940).			Expenditure for three months (1st April to 30th June 1940).			Total.	
	RS.	RS.	A.	P.	RS.	A.	P.	RS.	A. P.
1 Pay of officers and establishment.	15,200	11,438	10	0	3,806	14	0	15,245	8 0
2 Allowances including travelling allowance.	5,500	4,656	12	0	1,675	9	0	5,732	5 0
3 Contingencies ..	1,000	703	10	10	67	15	6	771	10 4
Total ..	21,700	16,799	0	10	4,950	6	6	21,749	7 4

II. Receipts.

Head of account.	1939-40 (1st July 1939 to 31st March 1940).			For three months (1st April to 30th June 1940).			Total.	
	RS.	A.	P.	RS.	A.	P.	RS.	A. P.
Deposit account of grant made by the Imperial Council of Agricultural Research Marketing Scheme ..	6	6	0	0	4	0	6	0

STATEMENT OF RECEIPTS AND CHARGES—PROVINCIAL FUNDS.

I. Receipts—Nil.

II. Expenditure.

Head of account.	Budget provision, 1939-40.	Expenditure, 1939-40 (1st July 1939 to 31st March 1940).			Expenditure for three months (1st April to 30th June 1940).			Total.	
	RS.	RS.	A.	P.	RS.	A.	P.	RS.	A. P.
1 Pay of officers and establishment ..	17,275	13,353	7	0	4,855	14	0	18,209	5 0
2 Allowances including travelling allowance ..	6,200	5,023	4	0	1,058	2	0	6,081	6 0
3 Contingencies ..	1,750	1,366	0	10	341	9	0	1,707	9 10
Total ..	25,225	19,742	11	10	6,255	9	0	25,998	4 10

MADRAS,
3rd August 1940.

K. GOPALAKRISHNA RAJU,
Provincial Marketing Officer.

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