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MADRAS GOVERNMENT

ADMINISTRATION REPORTS OF SUBORDINATE
OFFICERS OF THE DEPARTMENT OF
AGRICULTURE, MADRAS, FOR 1944-45.

ADMINISTRATION REPORT OF THE PRINCIPAL, AGRICULTURAL COLLEGE, COIMBATORE, FOR THE FASLI YEAR ENDED 30TH JUNE 1945.

I submit below the annual report for the fasli year 1944-45.

2. *Charge.*—I was in charge of the post for a period of six months during the year under report and was away on leave from 20th October 1944 to 19th April 1945. During the period of my absence Sri C. R. Srinivasa Ayyangar, the Paddy Specialist, was in charge of the Principalship.

3. (a) *Gazetted staff.*—Sri C. Narasimha Ayyangar availed two months' leave from the 22nd June 1944 preparatory to retirement. I was in additional charge of the post of the Estate Civil Engineer till Sri U. Madhava Rao joined at this Institute. Sri U. Madhava Rao joined his post on the 15th July 1944.

Sri R. N. K. Sundaram posted as Gazetted Assistant in the post sanctioned in G.O. No. 1524, dated 12th April 1945 for one year from the date of appointment joined duty at the new station on 25th June 1945.

Sri U. Madhava Rao availed of leave on average pay from 12th May to 9th June 1945 and Sri M. Audinarayanamoorthi, the Civil Supervisor, was ordered to hold additional charge of the post of the Estate Civil Engineer.

Sri N. Sankaranarayanan posted to officiate as Estate Civil Engineer at this Institute at the end of the year under report joined his post on the 4th July 1945 and relieved Sri U. Madhava Rao transferred to Anantapur.

(b) *Non-Gazetted staff.*—Sri M. Audinarayanamoorthi, the Civil Supervisor, joined the post created as per G.O. No. 2776, Development, dated 27th June 1944.

Sri P. V. Sambasiva Rao, the upper subordinate posted for vocational training as per G.O. No. 1524, dated 12th April 1945, joined his post on the 18th May 1945. He was transferred from Pithapuram to impart instructions to military men in Telugu. Sri G. K. Valeeswara Iyer, the draftsman, was transferred to the

Research Engineer from the 18th December 1944 and the post of the Research Engineer was still unfilled for want of a qualified candidate.

Sri R. S. Bharaman availed of three months' leave from and was transferred to the Electricity department

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from the date of expiry of his leave, and one Sri T. K. Chidambaram of the Electricity department was posted as Supervisor at this College.

4. *Tours*.—Sri C. R. Srinivasa Ayyangar while as Principal attended the ordinary meeting of the Academic Council on 16th February 1945 and the annual meeting of the Senate on the 23rd March 1945.

The usual tour to Samalkot and Madras for selection of students was not undertaken this year as per orders from the Director of Agriculture, as personal interviews of candidates were dispensed with.

5. *The College*.—The College reopened for the second and third year classes on the 15th June 1945 and the first year students commenced working only from the 16th July 1945 as per orders of the Director of Agriculture, Madras, to synchronize with the opening date of the second Agricultural College at Bapatla, Guntur district, recently sanctioned by the Government.

6. *Admissions, 1945*.—Consequent on the fixing of 30th June 1945 as the last date for the receipt of applications for the B.Sc. Ag. Degree course and in view of a greater number of applications from candidates the selection work had to be postponed from the 3rd week of June, as usual, to 3rd July 1945. A total number of 922 applications were received from the candidates and the actual selection work was done in the current fasli year by both the Principals of the Bapatla and Coimbatore Colleges. The selected candidates were informed on the 3rd July 1945 to join the class on the 16th July 1945. Details of selections are furnished below.

The enhanced strength of the number of candidates to be selected to meet the increased demand for Agricultural Graduates was maintained this year also, and this is the second year of the application of G.O. Ms. No. 2776, Development, dated 27th June 1944. A total number of 922 applications were received for both this and the second college at Bapatla. Selections were made at Coimbatore by both the Principals as the interview of candidates at different centres were dispensed with. One hundred and eighty-five candidates were selected—89 for Coimbatore (excluding reserved seats for Native states and Orissa Province) and 96 for Bapatla. Intimation of selections were posted to all candidates on the 3rd July with instructions to join the College on 16th July 1945 at their respective colleges.

Vacancies caused by selected candidates not joining were filled from the men on the waiting list, on the 22nd July 1945. This numbered to 15 for this College. Of the three seats reserved for lady students this year as sanctioned in G.O. No. 1135, Development, dated 20th March 1945, only two seats were filled up for this College and two for Bapatla as there were only four applications on the date of selection.

A statement according to communal and linguistic basis are reproduced below :—

According to community—

Brahmans	38
Non-Brahmans (including one member from Cochin Royal Family).	37
Muslims	2
Christians	5
Backward Communities	14
	96

Two failed students of the first examination held in the month of March 1945 joined the course from the beginning of this academic year, thus the total strength on the first year class on this date is 98.

Linguistic basis—

Telugu districts	32
Tamil districts	46*
Kannada	5
Malayalam	6
Coorg	1
Reserved seats	6
	96

* Included two lady candidates.

Reserved seats—

Cochin	*1
Banganapalle state	1
Hyderabad State	1
Orissa Province	3
	6

Total number of candidates .. 90+ 6
= 96

* Only one candidate joined.

Vocational training for military men.—As per orders contained in Government Memorandum No. 60690/44-28, Public (Civil Defence), dated 10th January 1945, and E-2-45, dated 14th February 1945, vocational training in agriculture and other allied subjects were given to a batch of 20 men at a time deputed from Military centres. The first batch of the kind was started on the 1st February 1945 and ran up to 30th April 1945. The military personnel attended the course this time being Tamil. A course for another batch commenced from the 1st May 1945 and ran till the end of 31st July 1945. This batch consisted of Telugu-knowing men.

Besides the above a batch of sepoys deputed from the third Madras Regimental Centre were also given training in practical agriculture from the 1st November 1944 to end of 31st January 1945.

A batch of King's Commissioned Officers and Viceroy's Commissioned Officers were also given lectures by various heads of sections at this institute including District Agricultural Officer, the Deputy Director of Agriculture and Officers of other departments on Rural Reconstruction.

In order to handle the vocational training classes a Gazetted Officer, with an upper subordinate and two peons, were sanctioned by the Government for a period of one year from the date of appointment.

The present course commenced from the 1st August 1945 and the personnel for the course reported at this College are Malayalam-knowing candidates.

7. *Short courses.*—Due to the increase in the number of admissions for the B.Sc. Ag. Degree course from the year 1944, the short course in practical agriculture comprising of various subjects had to be suspended as a temporary measure.

8. *Students' tour.*—Consequent on the restriction in travel and other inconveniences long educational tours were not undertaken for the second and third year students. The students of Class II were taken on tour to Mettupalayam, Kallar, Coonoor and Class III students were taken to Pasumalai, Madura and Dindigul besides petty week-end tours to villages adjoining the Central Farm and the Institute.

9. *Examinations.*—Terminal Examination and Selection of students for the University Examination :—

Four students from Class II and 3 from Class III were detained from appearing for the University Examination held in the month of March 1945 as per the decision of the College Board. All the 92 students of Class I were sent up for the University Examination.

University Examination.—The result of the B.Sc. Ag. Degree Examinations in 1945 are as follows :—

	* Number appeared.	Number passed.
First examination	* 92	81
Second examination	* 48 (40+8)	38+8
Final examination	39	39

* Including reference students and private study.

All the eight students who had reference in one subject in the third year examination of 1944 completed the subject during the 1945 examination.

10. *Scholarship.*—The details of scholarships awarded to the students of the B.Sc. Ag. Degree course are furnished in the following statement :—

	First year.	Second year.	Final year.
Mohamadans	* 2	1	1
Backward Communities ..	* 2	3	3
Scheduled Caste awarded by the Labour Department (Provincial).	* 2	..	..
Government of India Scheduled Caste scholarship ..	* 2	..	..

* Allotments in 1944-45, Doctor Rangachari's Technical scholarship was awarded to a student of Class II.

11. *College Board.*—Only one meeting of the Board was held during the year under report in December 1944 to select candidates to appear for the University Examinations.

12. *College Hostel.*—The average strength of students that stayed in the hostel during the year under report is 175 as against 133 of the previous year. This was due to the increased admissions to B.Sc. Ag., first year class. During this year there were three cases of typhoid fever among the students. All recovered but subsequently one student Ramakrishna by name died in his home after he left the College. Owing to the prevalence of the epidemics of plague and smallpox in the surrounding places all the inmates of the hostel were protected by vaccination compulsorily.

Consequent on the transfer of Sri T. Nataraj for district work, the wardenship fell vacant and was filled up by the appointment of Sri V. Gomathinayakam as warden. Consequent on the admission of lady students for this College another post of lady warden was created from the beginning of this year, and the post filled from the 16th July 1945.

In order to meet the increased demand for living and other accommodation at the hostel the dining halls, bath rooms and latrines are being remodelled to meet the situation and the work is now in progress.

Besides special messes to cater the needs of Military personnel and students remaining at the hostel during the holidays three messes were run throughout the year for students (General, Telugu and Non-vegetarian). The annual average attendance and the average daily rates of all the three messes are noted below :—

	Average attend- ance.	Daily rate.
		RS. A. P
General mess	43	0 14 3
Telugu mess	63	0 13 11
Non-vegetarian mess ..	57	0 15 5

The hostel day was celebrated by the first week of March 1945 and all the inmates participated in the function.

Rice, the chief item of the essential commodities for the hostel was obtained from the Central Farm and the Paddy Specialist as per orders of the Government. All other items were purchased locally. The prices of all food materials continues to rule high and much difficulty was experienced in procuring blackgram, dhall, fuel, wheat, etc. The general health of the students remained good throughout the year under report.

13. *Students' Club*.—The inaugural address of the Club was delivered by Rao Bahadur Dr. B. Viswanath, C.I.E., D.Sc., F.I.C., presided over by Sri L. N. Dutt, Government Sugarcane Expert. The Club Day was celebrated on the 24th February 1945 under the presidency of Rao Bahadur C. S. Chowdry, District Judge, Coimbatore. Five lectures and one debate were held during the year, the prominent among the speakers being Mrs. Barnes, M.A., of the London Mission, Dr. T. S. S. Rajan, ex-Minister, and K. C. Ramakrishnan, M.A., Professor of Economics.

14. *Games*.—The standard of games of the students of the College was of a high order all round during the year under report. The College team won the Badminton Tournament of the Government Arts College. Three students were selected for the "Coimbatore" to play the Exhibition Cricket Match against the R.I.N. in aid of the Red Cross Fund. Five records were beaten in athletics during College Day sports, viz., high jump, 100 meters 200 meters and 400 meters dash and hop-step and jump, for three of which the credit goes to student M. Venkateswara Rao, who won the V. Krishnan Nayanar Cup. The Parlakimedi Cup for all round sportsmen went to student A. S. Krishnan.

15. *College Day*.—The Thirty-third College Day and Sports were held on the 10th February 1945 on the College grounds. New records were created in the following five events—(i) high jump, (ii) hundred meters dash, (iii) two hundred meters hurdles, and (iv) hop, step and jump and four hundred meters race.

Special Lectures.—The Maharaja of Travancore Curzon lectures were delivered by Rao Bahadur Dr. B. Viswanath, C.I.E., D.Sc., F.I.C., Director of Agriculture, Madras, from 2nd to 5th February 1945, on the Science of Paddy Soils in Relation to Growing of Paddy.

16. *College Museum*.—Besides catering to the needs of teaching for the B.Sc. Ag. Degree course students of this College, the Museum attracted a large number of visitors from outside, chiefly military personnel, students from various institutions and the general public. The number of visitors during the year was 12,266 against 9,228 of last year.

17. *Library*.—Sri D. B. Krishna Rao is in charge of the library. The handicap noted in the report of last year, viz., difficulties due to change of staff in working the open access system, continued

during the present year also. The staff in the library was increased by an assistant librarian and one clerk and one attendant due to the increase in the number of admissions of students in the College.

During the year under report 929 books including bulletins, annual reports, etc., were received in addition to 1,618 current numbers of periodicals. Of these 1,263 numbers of periodicals were circulated among the heads of sections at Coimbatore as well as to those in the mufassal. The bulletins register recorded 675 publications as having been received. The receipts in the year under report shows a general increase as compared to the receipts in the previous year. The open access system was in vogue throughout the year and this was availed of by all the staff at the Research Institute and the College (teaching staff) the 'Readers' register recorded an entry of 2,600 and the number of books consulted were 7,040. The publications sent to the Government Press were returned unbound on the ground of pressure of work there.

The cataloguing work and the preparation of index cards for the publications received as mentioned in last year were in progress. About 900 duplicates of publications in the library were selected and transferred to the newly opened Agricultural College, Bapatla.

18. *Estate Committee*.—The usual monthly meetings of the Committee were held in the first week of every month to consider the estate sanitation and other subjects.

19. *Electricity—Essential Services*.—The erection of a second transformer which was started last year was completed during the current year. The new 75 K.V.A. transformer specially attached to the malt factory was energised and commissioned from 23rd December 1944. The voltage, current and earth tests, were carried out twice during the year. The total consumption of energy through the estate transformer was 1,85,406 units with a maximum demand of 55.46 k.w.

20. *Gas supply*.—To supply the needs of the research and students' laboratories, gas production was continued regularly. Gas was manufactured on 33 occasions with a total outturn of 4,84,000 c.ft. of gas. One of the cast iron retorts which was found cracked was renewed.

21. *Water supply*.—The two pumping sets were worked in full swing, during the year to a daily average of 14.2 hours. The average daily consumption of water ranged from 49,750 to 62,805 gallons. The water-supply system was kept in condition by periodical inspections and cleaning.

22. *Activated sludge plant*.—The work of this plant was suspended and it is kept in condition by periodical cleaning and oiling as a preventive against rust and corrosion. The engine was transferred to the Agricultural College, Bapatla, at the request of the Research Engineer.

23. *Civil Engineering*.—The items of work carried out under the supervision of the Estate Civil Engineer under maintenance of roads

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and non-residential buildings numbered 26 to the extent of Rs. 2,980. In addition to the above the following items of works were carried out on behalf of the heads of sections at the Institute :—

	Rs.
Repairs to the Chemistry P.C. House	60
Extension to the veterinary hospital of construction of the cattle and poultry isolation shed for the Superintendent, Central Farm.	300
Embedding of the cash chest in Government Mycologist's office	18
Construction of the temporary latrines in the hostel	206

The number of estimates prepared for the works came to 69 totalling to the value of Rs. 19,233 in addition to the following major works :—

	Rs.
(i) Rough estimate for building of the cotton breeding station	20,000
(ii) Extension to the veterinary hospital (two revised estimates)	9,400
(iii) Repairs to roads (three revised estimates).	1,035

Teaching.—To cope with the increased work caused by the large number of students admitted, an additional supervisor was sanctioned during the year. But it is unfortunate that the post of draughtsman who was transferred to the Research Engineer's section has been kept unfilled till now. This works as a hardship to the staff in the Civil Engineering section to satisfactorily meet the demands of the estate and heads of sections as well.

Fire drill.—The usual weekly fire drill practices for the peons at the institute was in charge of the Civil Engineering section and were held on all Wednesdays. The fire appliances, viz., hydrants, pumps and hoses were kept in good condition.

24. *Health and Sanitation of the Estate.*—There were 18 births and ten deaths during the year under report. Only one case was due to preventible disease, viz., smallpox and the rest were due to natural causes.

Plague started in the Coimbatore town and villages surrounding the estate this year also and had its usual toll. As a precautionary measure against this fell disease prophylactic inoculations were conducted on 450 individuals on the estate and the students and hostel servants compulsorily. The consignments including food stuffs coming from the town were fumigated with cyano gas or sun-drying as the case may be.

Smallpox.—This was very virulent in the villages round about. The estate was not proof against this disease. The peon's line

near the students' hostel was the centre of its activities. There were on the whole nine attacks and one (which was old and unprotected by vaccination) death of this disease. Seventeen cases of chickenpox were reported and none of them was attended by any complications or serious after-effects. As reported elsewhere there were three cases of typhoid in the hostel of which one that went away to his native place proved fatal.

Experiments on composting rubbish with nightsoil was terminated but the process was continued to cover the whole area selected in F. No. 37.

The usual anti-mosquito campaign was carried on with malarial kindly supplied by the Government Entomologist and Gas House Tar.

25. *Centralized activities.*—The usual activities, viz., allocation of subordinate officers' quarters on the estate, arrangements for essential commodities for the residents and dealing with public enquiries connected with the college and the estate were continued. A Fair Price shop to cater to the needs of students, estate residents and the general public was started on the sanction of the Controller, General of Civil Supplies, Bombay. This has commenced working from the middle of July 1945 as an adjunct to the College Hostel. The shop deals with stationary, toilet and other small articles. As soon as the proposed co-operative stores begins to function this aspect of work will be placed under its control.

26. *Board of Honorary Visitors to the College.*—The three-year term of the Board of Honorary Visitors to the College constituted in accordance with G.O. Ms. No. 237, Development, dated 3rd February 1942, expired by 1st April 1945. After the lapse of the term no new Board has so far been formed. The proceedings of the last meeting of the Board held in the month of March 1945 has already been communicated to the Director of Agriculture for necessary action. Subsequent to this no further meetings were held as the term of the Board constituted has ended with the 31st March 1945 and no member of the Board has visited the College from 1st January to 31st March 1945.

27. *Visitors.*—The important visitors in the year under report are :—

Dr. J. N. Mukerjee, Chief Chemist, Tata Oil Mills.

Mr. Raza Kasmi, Officer-in-Charge, Research Farm, Nizam Sugar Factory.

G. W. Priestly, Esq., Adviser to His Excellency the Governor of Madras.

Hon'ble Sir Jwala Prasad Srivatsava, Food Member, Government of India.

Members of the Board of Examiners.

Dr. F. P. Coyne, Director of Storage, Food Department.

Mrs. C. H. Masterman.

Two Chinese delegates—Qa Ma and Chian and Dhanda of the Imperial Veterinary Institute.

Sir S. V. Ramamoorthi, Adviser to His Excellency the Governor of Madras.

Major C. H. Johnson, D.A. (Ag.) Coorg.

Members of the Turkish Delegation.

Col. Travers, S.R.L.O.

S. P. Roy Chowdry, Esq., Soil Survey Officer of the Imperial Agricultural Research Institute, New Delhi.

W. R. S. Sathianathan, Esq., I.C.S.

COIMBATORE,
25th August 1945.

P. V. RAMIAH,
Principal.

ADMINISTRATION REPORT OF THE PADDY SPECIALIST FOR 1944-45 (FASLI 1354).

Charge.—Sri C. R. Srinivasa Ayyangar was in charge of the paddy section during the year except for the periods 19th October 1944 to 11th January 1945 and 12th January 1945 to 19th April 1945 when Sri M. Anandan and myself acted as Paddy Specialists respectively. Sri K. B. Viswanadham was promoted to the gazetted rank as Assistant Paddy Specialist on 12th January 1945 to 19th April 1945 and again from 11th May 1945 to 10th June 1945 when I went on leave on average pay. As in the previous years the Paddy Specialist was in direct charge of the Agricultural Research Stations, Maruter and Pattambi, Rice Research Station, Tirurkuppam and Paddy Breeding station, Mangalore. He also exercised technical control over the Rice Research Stations at Buchi reddipalem and Ambasamudram. For a third year in continuation he was in charge of the scheme of maintenance of viable crop cultures in paddy, gingelly and redgram of the Government of Burma.

2. *Season.*—Though a total rainfall of 32.84 inches recorded at Coimbatore on 81 rainy days as against the 24 years average of 25.36 inches and 84.11 wet days, was in excess, its distribution was far from satisfactory. The months of August and September continued to be dry with no water in the tank and as such all the cultivation had to be suspended till October. The late operation did not help to harvest a good crop. Again, the deficit rainfall of 25 inches in south-west monsoon and a shortage of 10 inches of north-east monsoon caused spells of drought and dislocation in planting of the first and second crops at Pattambi in Malabar. But the heavy showers of November made up to some extent the yield of the second crop which approached the average yield. In contrast to this, the conditions at Maruter were quite normal and favourable for both first and second crops of paddy where an average quantity of 40.32 inches in 70 days was received. At Tirurkuppam, a precipitation of 61.85 inches of rain in 71 days was recorded which was in excess of the five-year average of 49.34 inches. Though the distribution was not satisfactory giving rise to spells of drought, the heavy showers of north-east monsoon more than made up for the deficiencies to ensure a good crop of samba. At Ambasamudram, the fall of 50.67 inches was in excess of the average, but due to defective south-west monsoon, the kar or first crop yield went low, while the pishanam yield was normal. Similarly at Buchi reddipalem 40.85 inches of rainfall was in excess of the average. Due to the timely rains of south-west monsoon, the first crop was a success whereas the second crop suffered from drought from December onwards.

3. *Transplanting.*—The number of transplanted experimental units at Coimbatore was 10,063 for the first and second crop together while for the stations at Maruter, Pattambi, Tirurkuppam and Mangalore, they were 1,743, 3,848, 13,778 and 296 respectively.

4. *Seed distribution.*—Seed from all the Agricultural Research Stations was distributed to meet the requirements of primary seed farms run in the districts.

5. *Strains released during the year.*—Of the three cultures of Rangoon samba tried both in the districts and on the Paddy Breeding Station, Coimbatore, culture No. 1024 did best and the higher yield in favour of the strain works out 15 per cent. This will be released as Co. 23 (Rangoon samba). In Malabar, culture No. 4745 isolated from Thekkan, the popular second crop variety fared best with 13 per cent average extra yield and culture No. 4745 will be sent out as PTB. 21 (thekkan). Among the anaikomban selections of Ambasamudram, culture No. 2927 given to the ryots two years ago has earned a reputation over anaikomban bulk and Co. 8 (Tinnevely-Anaikomban) an earlier release, from Coimbatore. It has recorded 12 per cent extra yield in its favour over Anaikomban bulk and is proposed to issue culture No. 2927 as ASD. 6. (anaikomban). Culture No. 1296 from kar samba red is finding favour of the cultivators at the tail end of Tambarabarani valley of Tinnevely district due to its bold grain and 12 per cent average higher return over bulk kar samba red. It is also shorter in duration than ASD. 1 (kar samba red) by a week and so culture No. 1296 is to be given out for general cultivation as ASD. 7 (kar samba red).

6. *Work on the isolation of strains resistant to blast.*—Work on the isolation of a blast resistant strain in molagolukulu the ruling variety of Nellore, has been in progress since 1938 and as a result thereof seven cultures combining high yields and relative resisting power to blast are available. They were tried this year too in four taluks of Nellore district and also on the Rice Research Station, Buchireddipalem. Though the culture Nos. 2,552 and 2,202 yield better than the standard molagolukulu and have become popular, their ability to resist blast could not be gauged this year also on account of the absence of *Piricularia oryzae* (blast) in an epidemic form. In the deltaic taluks, 2,552 is preferred to other cultures for its fine grain, yield and resistance to blast while in the upland, Kandukur, Kavali and other taluks, 2,202 is liked by the ryots, among other considerations, for the high percentage of rice to paddy. Culture No. 2552 was grown in the year under report over 1,000 acres for rapid distribution of seed. At Sulurpet this culture gave an acre yield of 4,500 lb. All the cultures are to be tried again in the coming season, and it is hoped that by the end of the present year the best strain will be fixed satisfying all the requirements.

7. *Cultures under trial in the districts.*—The three cultures Nos. 987, 1013 and 1024 of Rangoon samba passed their second year of trial in Coimbatore district in addition to their being tried at the Paddy Breeding Station, Coimbatore. Culture No. 1024 did best with 15 per cent of extra yielding in its favour. Two cultures Nos. 4708 and 4745 of Thekkan, a popular second crop variety of Malabar were tested under ryots conditions and 4745 did better than No. 4708. Seven promising cultures of molagolukulu of Buchireddipalem underwent rigorous test in four taluks of

Nellore district for a second time. In the absence of blast, their relative immunity to that disease could not be assessed and so they have to be tried again. Three cultures of atragada compared with local atragada in Kovur taluk gave increased in yield varying from 24 to 32 per cent over the standard quite against the findings of Rice Research Station, Buchireddipalem. The culture from Arikaravi under test in the district did not impress the ryots and so it will be given up from further trials. Two cultures of thonnooran and two of keeripala and one in Vadakkan have to their credit high yields going up to 32 per cent in the district and 38 per cent on the station.

8. *Cultures under different stages of trial.*—Of the ten promising cultures of bangarutheegalu of Kurnool district and 47 of pudupatti samba from Salem district, three of the former and 30 of the latter have been selected for further tests. One hundred and eight cultures from seven Gudalur (Nilgris) varieties, and 135 from an equal number of varieties of Ramnad which showed increases varying from one to twenty-five per cent were selected after the first year's trial. At Maruter, ten cultures of atragada giving 13 to 40 per cent extra yields over MTU. 12 (pedda atragada) have been taken over. Twenty-seven cultures of kusuma, konamani, prayaga and gummasari possessing significantly higher yields than their respective standards were chosen for further tests. Three mutants from MTU. 3 and MTU. 4 (basangi) yielded significantly better results than their standards, MTU. 3 and MTU. 4 under late planted conditions coming thereby for the second year tests. At Pattambi, in Malabar, ten cultures in annachamban, valiachamban, chenkayama, chuvannavattan, veluthavattan and cheriya aryan have come up to the final year of trial by their performances and they will be tested in the district also in the coming season in addition to the trial at the Agricultural Research Station, Pattambi. For the second crop, two cultures of each of kodian, and vellakoli which did well in the season are selected for district trials. Forty-eight other cultures selected from guduboliyare, arikarai, iruppappochamban and aruakari and bengala chitteni have been selected for further trials, due to their high yields in comparison with the respective varieties used as standards. At Tirurkuppam, over 1,800 cultures isolated from eleven varieties suitable for the three seasons, swarnawari, samba, and navarai seasons, for the varying conditions of rainfed, semi-dry, and wet situations passed their yield tests. Due to unfavourable seasons the test of most of the cultures will be repeated in the coming season. On the Rice Research Station, Ambasamudram, 33 cultures taken of tuyyammalli, avasara samba, Veedhivadangan for Kar crop recorded increases ranging from 5 per cent to 20 per cent while in the pishanam (second crop) 12 cultures of kolavalai did better than the local Kolavalai with the extra yield varying from 5 to 15 per cent. At Buchireddipalem it is gratifying to note that one culture in Pishanam the once ruling variety of Nellore, yielded 50 per cent more than pishanam bulk, while its average increase for four years works out to 30 per cent. Of the 24 cultures of molagolukulu tried, six cultures are suited for both

early and late planted conditions and the increases range between 2 to 26 per cent in early and 4 to 56 per cent under late planted conditions. On the Anakapalle Research Station, 49 promising cultures pertaining to dasaradhi bhogam, prayaga, vazanam and Yerrasannam have been taken over for further yield tests. Two hundred and nine other cultures were also tested with varying results.

9. *Varieties taken up for selection.*—With a view to improve the yield in the Wynaad varieties, 1,293 cultures were taken from 14 varieties grown at the Paddy Breeding Station, Coimbatore. At Tirurkuppam further selection was made of 658 cultures from the six samba varieties suitable for the tract. At the newly opened station at Mangalore, 400 selections were taken for study from bili kayama and badaka biliyari of South Kanara and vella kayama of North Malabar. Since the best strain 4960 did not impress the ryots, 200 fresh cultures were taken of the same variety arikarai at the Rice Research Station, Ambasamudram.

10. *Introduction.*—T. 672, the patnai type is spreading rapidly in Salem and Coimbatore districts. At Tirurkuppam, CO. 5 (chinna samba) and ADT 22 (vadan samba, North Arcot) remained in a par under early planting and among the long duration strains pishanam 1283 (Buchi) and CO. 19 (Chingleput sirumanian) yielded significantly higher yields over ADT. 17 (muthu samba), CO. 8 (Tinnevely anaikomban); CO. 12 (sendhinayagam) when planted early. Under late planted conditions, CO. 19 (Chingleput sirumanian), CO. 12 (sendhinayagam) and ADT. 17 (muthu samba) gave significantly greater yields over CO. 8 (Tinnevely anaikomban) and CO. 12 (sendhinayagam). At Maruter two strains of molagolukulu from Buchireddipalem tried with MTU. 1 (bontha Akkalu) gave promise of yield though they flowered earlier. Likewise five strains of konamani from Samalkota failed to do better than MTU. 11 (konamani). The three basangi, rasangi strains SLO. 7 and SLO. 8, SLO. 9, proved to be lower in yield than MTU. 3 (potti basangi). Again, the three akkullu strains SLO. 6, SLO. 13 and SLO. 14 fared poor in comparison with MTU. 2 (potti akkullu).

11. *Hybridisation for crop improvement.*—Five hybrid cultures of 16th generation of a cross between CO. 4 (Gobi anaikomban) × korangu samba together with one of the mutants of ADT. 11 (Nellore samba) have been selected for extensive trials in three districts after four years trials at the Paddy Breeding Station, Coimbatore and two to three years at the Agricultural Research Stations, Aduturai and Pattukottai of Tanjore district. Two hundred and seventy single plants from 87 promising families are selected from the fourth generation of nine sets of crosses between CO. 4 and a number of susceptible varieties. Among the inter-strain multiple crosses, 12 cultures gave significantly higher yields than CO. 8 (Tinnevely anaikomban). Two of the cultures tried of GEB. 24 (kichili Samba) X Co. 1 (peria kichili) cross proved themselves to be definitely better than the standard. Again two

cultures of cross GEB. 24 (kichili samba) X T. 619 (kolamba) scored over the standard. The attempt to use hybrid vigour of F-2 of three sets of cross between the three promising strains of Rangoon samba and two of manavari failed. From the kavungin-poothala natural crosses forty cultures are carried over for this year's trial. As a result of the examination of the progenies of different crosses 1,233 single plant cultures have been selected for further purification and study. At Maruter, from the progeny row trials, of the cultures isolated from numerous crosses, 60 cultures of the GEB. 24 type and duration group, 160 of Krishnakattukulu type and duration, 67 from badava kusuma group, 122 from konamani group and seven from atragada group have been selected for further study. At Pattambi, two cultures Nos. 2800, 2801 forming the natural cross progenies from PTB 9 (veluthari thavalakkannan) have come to the final stage and will be tried in the district. From among the various generations of five sets of inter-strain crosses promising plants are taken for purification. Selections are taken also from the F-2s of inter-strain crosses for study. To improve the short duration strains, 15 sets of cyclic crosses were effected. The 14 cultures tried at the Rice Research Station, Tirurkuppam from the season and period bound crosses resulted in selection being made of 711 single plants. For samba season, 353 plants from F-2 and other desirable bulks were taken from the crosses among Coimbatore strains. One hundred and sixty-five cultures with fine grain size and pure for flowering and from season and period bound cross progenies were marked for further tests.

12. *Agronomic studies—Cultural experiments.*—At Pattambi, it was noted that when the monsoon was weak the seedlings from a late sown nursery did better than those from early sown seed-beds in the case of a long duration strains like PTB. 1 (aryan) and PTB 13 (kayama). No difference was noted in the cropping value of seeds of the same strains from the different seasons of the year except that the plants resulting from the seeds of the first crop flower a little later than the crops from the other two groups of seeds. Among the strains and varieties tried in regular alkaline soil at Coimbatore and Tirurkuppam, Tellathoka vadlu of Chittoor district resisted salinity well, closely followed by S.R. 26-B (Uppu neeti vithanamu). No significant difference in yield could be noticed in planting seedlings on the sides of the ridges and in usual way on flat surface. Growing groundnut in swarnawari season and plant paddy in samba season gave best results in comparison with paddy following either ragi or cambu or gingelly and fallow in the wet soils of Tirurkuppam. At Buchireddipalem the practice of dry ploughings and plantings soon after the receipt of water did not yield such results as growing a green manure crop puddling the green stuff and planting paddy seedlings under swamp conditions. In the storage experiments conducted at South Kanara, it was noticed that metallic bins helped to preserve viability best closely followed by 'murra' (straw twists) covered with thick coating of cow dung and mud with 90 per cent viability in September.

13. *Manurial trials.*—The complex experiment of three kinds of cakes, groundnut, castor and neem and four levels of nitrogen 0 lb., 20 lb., 40 lb. and 60 lb. per acre tried for a third season showed as in previous season, neem cake to be the highest in yield. There was progressive increase in yield with increased doses of nitrogen at Coimbatore and Pattambi. The same trial has shown at Maruter that a 60 lb. nitrogen dose is less than 40 lb. nitrogen and that neem cake to be significantly better than either castor or groundnut cakes. At Pattukottai for a short duration variety like ADT. 4 (Kuruvai) 60 lb. nitrogen topped the list in yield and castor cake gave the maximum return. The trial on the relative merit of gingelly cake versus groundnut oil-cake, it may be said as in previous year, no difference in the kind of cake could be discovered when applied on nitrogen basis. As regards time of application of groundnut cake, a dose of 40 lb. nitrogen was best suited to paddy irrespective of the time of application of manure either at planting or given in two doses. But this experiment at Pattambi indicated that applying 20 lb. nitrogen as groundnut cake three weeks after planting to be better than giving the full dose at planting and 40 lb. nitrogen dose could be utilized to better advantage when 20 lb. nitrogen is applied at planting and the other 20 lb. nitrogen three weeks after. At Maruter, no significant difference was noticed in the application of tobacco seed cake and castor cake to supply 40 lb. nitrogen for the first crop. The salvaged ammonium nitrate when tried with ammonium sulphate failed to show any advantage of nitrate over sulphate and it is advantageous to use the manures with leaf. The trial of calcined bone versus bonemeal and super phosphate pointed out that no advantage seems to exist in calcining the bone. At Pattambi it was recorded that wood ash applied to first crop gave the highest yield but it would appear to yield better in conjunction with groundnut cake at 400 lb. per acre or without leaf. At the same station it was also recorded that a dose of 200 lb. of fish guano per acre was as effective as 2,000 lb. of green leaf per acre for first crop. But fish guano at 400 lb. per acre, 200 lb. of fish guano with 2,000 lb. of leaf per acre and application of 4,000 lb. of leaf per acre were all on a par. The best form of green manuring a paddy broadcast crop on the West Coast was to get leaf from outside and apply.

14. *Irrigation experiments.*—The new set of treatments designed last year incorporating the suggestions of the Chief Engineer for Irrigation, Madras, was adopted this year too at all the three Stations. As in the previous season, the treatments were not statistically significant. Regarding the trial at Maruter, where the duty of 50 for pre-transplanting and 70 duty for post-transplanting periods were maintained for the second crop, it may be said that though a 70 duty would tend to economize the use of water, it is not without the expense of yield of grain. If the output of paddy has to be increased in the Godavari delta with the growing of a second crop, a 50 duty should be maintained from the preparation of the land to the harvest of paddy crop.

15. *D.D.T. trials.*—This experiment was conducted in collaboration with the Military Department to know if the application of D.D.T. (5 per cent solution mixed with sand) as an insecticide to control the malarial mosquito larvæ in swamp paddy fields has any deleterious effect on paddy crop. It is noticed that D.D.T. 5 per cent has had no ill-effect on both broadcast and transplanted crops of a short duration strain like CO. 13 (Arupathamkodai).

16. *Vegetables.*—As a means of increasing food production, the growing of vegetables is being pursued in all the research stations. At Coimbatore and Pattambi, crosses among the varieties of brinjals, ladies fingers, pumpkins and tomatoes have been effected to know the best combinations of parents to have the maximum heterosis to yield maximum fruits in F-1. A total quantity of 807 lb. of vegetable seeds of all kinds together with 1,298 pine apple suckers and 3,090 tapioca cuttings was transferred to circle officers.

17. *Burma scheme.*—A scheme for the growing of viable crop cultures in paddy, redgram and gingelly was continued on leased lands and on the Central Farm lands. Owing to the impending reoccupation of Burma, in addition to the maintenance of viable cultures multiplication of seed of the most urgently needed cultures was made. Under instructions adequate quantity of seeds was treated with fungicides and kept ready for despatch. A total quantity of 2,150 lb. of seed was sent about the end of the year to Burma. The scheme is being continued.

18. *Petty construction and repairs.*—The construction of the office and laboratory, the seed-store, the cattleshed, the engine-shed and threshing floor is nearing completion at the Rice Research Station, Tirurkuppam. At Pattambi, work on seedstore and threshing floors, taken up in March 1945 was completed. On the Paddy Breeding Station, Mangalore the construction of a mud wall along the boundary line in the dry area and two drains across the approach road were taken up and finished.

19. *Post-graduate students.*—Mr. Abeyaratne deputed by the Government of Ceylon and Mr. A. J. Chacko sent by the Director of Research, Travancore University had their post-graduate course in Plant breeding and Genetics.

20. *War efforts.*—Six lectures in practical agriculture in Malayalam and Tamil were given by the staff of the section to the soldiers stationed near Coimbatore and the Paddy Specialist delivered a lecture on Paddy Cultivation to the Gentlemen Cadets at the College.

21. *Visitors.*—The most notable visitor to the section during the year was Sri Sir S. V. Ramamurthi, K.C.I.E., Adviser to His Excellency the Governor of Madras.

COIMBATORE,
17th August 1945.

T. K. BALAJI RAO,
Paddy Specialist.

ADMINISTRATION REPORT OF THE COTTON SPECIALIST FOR THE YEAR 1944-45.

Charge.—I continued to officiate as Cotton Specialist throughout the year. The temporary post of the Assistant Cotton Specialist, Coimbatore, was filled up in August 1944 by transferring Sri S. M. Kalyanaram Ayyar from Siruguppa. Sri S. Sundaram and Sri N. Kesava Ayyangar were admitted to the Madras Agricultural Service during the year. The former officiated for short periods as Assistant Cotton Specialist, Siruguppa, till the latter took charge and as Assistant Cotton Specialist, Narasaraopet, when Sri C. Jagannatha Rao went on leave. Sri P. Abraham, permanent Assistant in Cotton, was promoted and appointed as Cardomum Specialist.

2. *Staff.*—The Cotton Research in the Province was handicapped to a large extent in putting through an intensified hybridization programme by diversions of research staff to food drive and expansion of breeding work in new areas without the minimum complement of trained personnel. The work was therefore confined to the major economic problems likely to be of immediate benefit to the cultivators. Besides the normal breeding problems on cotton and pyrethrum tackled at Coimbatore, the work on the improvement of other cottons carried on at Adoni, Siruguppa, Hagari, Nandyal, Narasaraopet, Gurzala, Palur and Koilpatti, and the breeding of chillies and tobacco crops at the Agricultural Research Station, Guntur, continued to be under my technical guidance.

3. *Season.*—The annual rainfall was in excess of the average by 8.12 inches. The preparatory cultivation and rainfed sowings of the cereal crops had to be postponed on account of the belated and irregular south-west monsoon rains. The month of November was the wettest during the north-east rains. The rains were heavy causing numerous breaches in bunds and damaging the standing crops. The months of May and June were rainless and windy, necessitating frequent irrigations to pyrethrum and vegetable area. The season was particularly adverse to rainfed cereals, pulses and late-sown cotton.

4. *Cotton trends.*—The various emergency regulations restricting the cultivation of cotton especially short staple styles, continued to be in force and affected the total area under cotton which shrunk by 26 per cent during the year. In order to help the maintenance of quality and reputation of cotton varieties grown in the southern area, the zone was bifurcated into two protected areas, viz., Cambodia, and Tinnevelles area, by suitably amending the Cotton Transport Act. The Government of India announced a token subsidy based on actual cropped area to cultivators of Westerns cotton in the year 1943-44, in order to offset the deterioration in

quality caused by unseasonal rains during harvests and lower returns realized per acre. Other steps taken concurrently to prevent admixture of old with new crop toned up the spot price of 1944-45 crop.

5. *Irrigated summer Cambodia.*—The experiments on irrigated Cambodia consisted of two portions, viz., summer and cold weather trials. The breeding trials on summer cotton conducted previously on leased lands at Srivilliputtur were shifted to Agricultural Research Station, Palur after examining the similarity in the agricultural conditions and response of the long staple varieties at both centres in the year 1944. Information on productivity and fibre properties was gathered on a set of eight families duplicated and sown in the two places at about the same time. The trends at Palur were: (1) a slight reduction in staple length, a large increase in ginning percentage and no influence on fibre : (2) a general lengthening of the maturation period; (3) a similarity in the yield response of early maturing types; and (4) its suitability for work on *barbadense* and late maturing varieties on account of humid weather at ripening phase. Among the new interspecific hybrid derivatives, X7682 proved to be a definite improvement over Co. 4 in quality which was later confirmed by experienced local businessmen who declared it to be equivalent to the inferior grades of imported African styles like Kampala. Another special attribute is its capacity to mature earlier than Co. 4 by a week without any reduction in productivity. This feature is a definite advantage in cutting down the irrigation bill and facilitating the early removal of cotton from the wet land blocks in the Ramnad district. The yield data gathered from two trials carried out with X7682 during 1945 on cultivator's lands, confirmed its ability to produce as much as Co. 4 in the Srivilliputtur area. Its fibre properties await examination.

One important observation made in the Co. 3 and Co. 4 seed farm areas near the trial plots in Salem and Ramnad districts respectively, is the rapid deterioration of Co. 3 or Co. 4 strain when both are allowed to mix and hybridize freely. Each by itself is a quality cotton in a pure state and the deterioration is very perceptible in a mixture of the two. Experiments are being designed to confirm this impression. Incidence of red leaf in a severe form was reported to be prevalent in Srivilliputtur during early stages, but the crop had subsequently recovered. Co. 4 is resistant to red leaf and the type of reddening noticed on a large scale may have been due to nitrogen starvation and the high temperature in the month of March when the crop was young. The aspect of manuring the irrigated cotton requires attention in order to ascertain the maximum potentialities for yield and quality under a system of economic application of nitrogenous fertilizers.

All long staple hybrids tested during summer happened to be late and neppy on account of high bad kapas content, and as such

they would be only useful as parents in interstrain hybridization. Re-selections to isolate a bio-type combining boll opening, fibre maturity and low irregularity in X7625 was given up on account of low variability. The second generation crosses between Co. 4 and Wilds received from Cotton Botanist, Sind, suffered from a severe attack of red leaf, and therefore selection was confined to a few tolerant plants possessing strong and fine lint. One hundred and sixty-six first generation hybrids consisting of planned crosses effected (1) to create a larger variability for the selection of bio-types suited to both summer and cold weather; (2) to eliminate specific defects like poor vigour, late habit, small bolls, bad opening, low ginning or neppiness; and (3) to exploit the potentialities of *barbadense* varieties for the improvement of fineness and strength in *hirsutum* types, were grown and harvested.

6. *Irrigated cold weather Cambodia*.—The farming practices of the major portion of irrigated cold weather crop in Coimbatore tract require a biotype with vigorous build and a capacity to utilize the high residual fertility of the heavily manured preceding ragi crop when sown late in October. The breeding area at the Cotton Breeding Station, Coimbatore was dibbled late in September in order to simulate these conditions but the crop suffered from a heavy incidence of boll worm and recorded yields lower than early sown cotton. The yield trials consisted of six cultures resistant to stem weevil and twenty families belonging to long staple group. The indications were: (1) X-82-1-5-3D—a vigorous derivative of interspecific hybrid—proved to be productive and resistant but coarse in quality; (2) the interstrain cross X7786 was productive but neppy; (3) re-selection Co. 4-B. 40-21 was outstanding for staple and maturity and deserved further trials as cold weather crop; (4) bad kapas content was very high in late maturing types; and (5) Co. 3 was subject to a severe blackarm attack. Trials on cultivators' lands were conducted in three districts but the yield data of two trials from Salem district alone were received and analysed. X7682 was found to be as good as Co. 3 under rainfed conditions and since the unirrigated Cambodia cotton occupies nearly three-fourths the total Cambodia in Salem district, its adaptability and spread will effect a pronounced change in the quality of 'Salem' Cambodia. Actual field examination and local enquiries made at Manaparai in Trichinopoly district revealed that X4463 had spread under the wrong name of 920 mainly on the initiative of an owner ryot in whose lands the trials were originally conducted. The harvests of the first generation hybrids sown during the summer of 1944 were raised in replication during the succeeding September as a cold weather crop. The entire population was examined in great detail and about 7,000 plants combining staple, strength, boll opening and resistance to blackarm were harvested and subjected to a thorough re-examination for quality before sampling in the laboratory. A tabulation of the percentages of effective selection made in the various groups of

crosses indicated that (a) the use of inter-specific long staple derivatives in hybridization introduced quality into *pempher*es resistant cultures, imparted strength to neppy lots, and induced wide variability and economic combinations in local strains and (b) the employment of Co. 2 as a parent increased the plant build and vigour but failed to increase the selective variability in crosses with all upland varieties except 7114 and Coker clevevilt. Fresh crosses were programmed and made after studying the type collection in great detail for every useful economic character, and grouping them suitably. Two inter-specific hybrids from Surat, viz., B.C. 134 Meade and B.C. 134 Coker wilds recorded good yields, staple length and quality when grown under irrigation, but were found to be susceptible to blackarm. They await more systematic studies during next year. A partially fertile hexaploid was obtained by treating with 0.15 per cent colchicine, a shoot of *G. raimondii* × 4463. The lint was fine, long and highly mature (93 per cent). About fifty per cent of the fibres was greenish tinged whereas over ninety per cent was coloured in the *raimondii* parent. The hexaploid is being crossed with both Asiatic and American cultivated types.

7. *Unirrigated cambodia*.—Breeding work on unirrigated cambodia consisted of district trials in South Arcot district and comparative yield tests at Coimbatore. The yield trends in the South Arcot district are in favour of × 7682 and Co. 4 over Co. 3 and indicate a greater adaptability of X7682. At Coimbatore all American varieties were poor on the black soil while G-1 × Co. 2-4-4-1-1 was more productive than Asiatic control on the red soil. The derivatives of *tomentosum* hybrids failed to give any yield. Fresh Surat hybrids have been received and will be tested during the next year.

8. *Breeding for uppam and nadam area*.—Rainfed trials on black soil disclosed that a hybrid selection × 7036-63 was consistent in both Comparative trials and family block, and that three other derivatives, viz., 7057-18, 7070-A-3 and 7111-9 were on a par with control in bigger yield tests. All of them, however, possessed higher mean values for staple and needed further purification and tests before sending out to the district for replacing inferior *uppam*. The selection work on perennial *nadam* aims at the isolation of an annual biotype capable of resisting drought and insect pests during crop growth and yielding about 300 lb. seed cotton when grown with rains in September on the red gravelly soils of Erode taluk. Progenies of two re-selections, viz., 1171 and 1175, from the strain L. 3-4/4 evolved in the Madras Herbage Scheme proved to be finer and more productive than control. Of these two, 1175 was reasonably pure while 1171 possessed enough residual genetic variance for applying secondary selection. The progeny row trials consisted of 736 cultures drawn from hybrids of K. 1, C. 7 and *nadam* with various extra provincial and

extra Indian types. The laboratory examination of 82 prolific progenies indicated that (1) no extra Indian parent other than Chinese R. 1 spotless contributed to productivity, (2) the selective variability was uniformly high in crosses derived from K. 1, C. 7 and *nadam* on the one side and Verum, Jarilla, Jubilee and Burma Silky on the other side and (3) the percentage of selections made in *nadam* hybrids with strains evolved in the Madras Herbaceum Scheme was considerably greater than others. A similar tabulation of the selections made in the second and third generations of direct and back crosses showed that K. 1 crosses with Gaorani 3 B or Verum early and *nadam* hybrids with C. 6-3 yielded the maximum number of good biotypes. New crosses involving early and vigorous types as basic parents were effected.

9. *Agronomic experiments*.—Mixed cropping of Cambodia-ragi once again proved to be more remunerative than pure cotton in spite of poor population of cotton plants in the mixed treatment. Working guntaka appeared to be the least expensive method of removing cholam stubbles, if both gross yields and net profits per acre were considered together. As such, the practice can be advocated as an item of propaganda among the dry land ryots of Coimbatore district. The cotton yields were not influenced by differential pre-cultivation. The influence of scanty rainfall and the limited opportunities available for carrying out the higher frequencies of cultivation are to be reckoned in interpreting the above results. Tenai crop which was substituted for cholam in the same experiment on account of belated rains, failed in growth and seed setting. In a set of experiments designed to study the combined effects of rotation and cultivation, deep cultivation and cotton following gram topped the list of treatments in yield. Preceding cotton and cumbu tended to lower the mean yields. There was another long range enquiry pertaining to the yield response of cotton and cholam coming in six different rotations. Bengal gram was damaged by caterpillar and cholam failed to set seed. The yield levels of cotton following cholam and gram were about the same while continuous cotton was once again poor. The poor performance after fallow was unexpected and inexplicable.

10. *Pyrethrum*.—Breeding trials on pyrethrum conducted with the object of evolving a biotype capable of being cultivated on the plains and lower elevations were continued. Planting as slips or seedlings succumbed in large numbers to attacks of three fungus diseases, viz., *alternaria*, *fusarium* and *rhizoctonia*, in spite of all preventive and curative methods adopted by the Government Mycologist. Tests of viability carried out in nurseries indicated a progressive fall after October. Fresh germination of dormant seeds in nurseries sown in May was noticed after the receipt of monsoon rains. This phenomenon possibly explains the high percentage germination usually recorded in the cooler and humid atmosphere of Ootacamund, and stresses on the need for conducting

germination trials under reduced temperature at Coimbatore. Attempts to induce mutation through treatment with colchicine were made without any visible effect on soaked seeds, germinating seedlings, and growing shoots. The crop raised from seeds and seedlings supplied by Mysore Government at Denkanikota having an elevation of 2,900 feet and receiving an annual rainfall of 35 inches, was reported to be early and fair in growth. Seedlings were obtained and planted for further studies. The reported self-sterility of pyrethrum was sought to be checked and used in crossing with other daisies like *C. anethifolium* and *C. frutescens*. The self-sterility was strictly confined to pollination of the same flower and development of a few healthy achenes was noticed in crosses between two heads of the same plant. It would appear that the present method of emasculation through slicing a portion of the disc florets in hybridization work could be replaced by the easier device of pollination and covering. Two seedlings of hybrid origin looking very similar to pyrethrum except in minor characters of stem and anatomy, were obtained. Their hybridity with *frutescens* awaits confirmation.

11. *Mungari Cotton Scheme*.—The object of the scheme is to eliminate from the 'westerns' and 'northerns' cotton tract, the short stapled *mungari* cotton which is utilized largely for mixing with other medium staple varieties grown in the same area. The season was unfavourable for the mungari cotton on account of delayed sowings and protracted drought during crop growth. The defoliation in the seedling stage by the red hairy caterpillar was rather severe and caused a deduced stand in the experimental block. The ryots' device of securing good stand by adopting a very high seed rate of about one maund per acre was commended as a successful dodge against the damage by the red hairy caterpillar at least in the comparative yield tests. Seven varieties were under test in the district. Type 881-F had a consistent performance and it was closely followed by Jarilla and Umri bani. The type had a very good report in the mill tests and was considered to be a warp cotton having a good staple, strength and regularity. Another season's test in the districts will confirm the suitability of 881-F for the mungari tract. Among the other early maturing medium staple cultures, 2069-A5 which has recorded significantly better yields than local in the preliminary comparative trials and family blocks, deserves special mention. None of the *hirsutum* varieties was as productive as the control. Twenty-three families and thirty progenies combined earliness, yield, staple and ginning. They await purification and yield tests in bigger plots. Six varieties showing low incidence to stenosis were used as parents in crossing with other prolific types.

12. *Cocanada Cotton Scheme*.—The breeding experiments aim at the isolation of a prolific type possessing deep lint colour, medium staple, good ginning and a wide adaptability. The seasonal

conditions at Narasaraopet were unfavourable for the full expression of lint colour. Cultures 123 and 129 had a uniformly consistent performance in the yield tests of the year. The report on technological properties of 129 was more satisfactory in blow and card room waste and spinning values than the local cotton. There were 306 biotypes comprising of primary and secondary selections from various bulks and intervarietal hybrid derivatives, in the replicated progeny row tests. Seven of these satisfied tests of yield but only three stood comparison in fibre properties. Culture 1395 was the most outstanding in the combination of attributes. Among the progenies recording yields equal to control, coloured derivatives of 336, 567, 599 and 1724 constituted improvements in staple and ginning over the best strain 129. Breeding trials for the eventual elimination of the short staple 'chinnapathi' cotton in the Visakhapatnam district were continued and the first stage of selection based on earliness, colour, staple and ginning was completed. As all the bulks under test contained no variability for the essential characters, it was necessary to launch on the next phase, viz., hybridization. Manipur khaki appeared to be potentially a good parent for increasing the variability of colour, staple and earliness in such crossing programme. The relation between boll maturation and lint colour was studied in the four standard colour grades. It was found that (1) colour development commenced only a week prior to the normal dehiscence of a fully mature boll, (2) the more mature the lint, the shorter the time required for the maximum expression of colour and (3) the colour development was quicker when the boll was removed and exposed than when allowed to remain on the plant. The dye absorption tests carried out by the Director, Technological Laboratory, Bombay, suggest a possible relationship between high dye absorption and low fibre weight but not the ultimate tint. Recent evidence let in, on this colour aspect showed that it was desirable to modify the original objects so as to ignore dye absorption and include dirtiness of the sample as a selection character.

13. *Cambodia Cotton Scheme*.—This is a scheme intended to benefit primarily the farmers served by the Tungabhadra Project but incidentally aims at the evolution of American types suited for the cultivation as unirrigated crop on the black soils of the Ceded districts. The experiments are conducted at three stations, viz., Siruguppa, Hagari and Nandyal. As the varietal response during 1943-44 was adjudged to be vitiated on account of belated sowings done late in October, all the 156 American varieties were once again subjected to tests under irrigation in replicated plots by sowing them at the proper time. There was an initial set back due to the presence of excessive moisture in the soil during the wet-test period of September-October. The vegetative and re-productive responses of the types were more or less in consonance with those of the previous season. Six types recorded yields significantly higher than control variety H.A. 11, while forty-two more,

were as productive as the check variety. The prolific group was made up of three Mysore-American, two Dharwar-American and one Parbhani-American types. Of these, M.A. VIII was easily the best for staple and ginning. Among the remaining equal yielders, mention might be made about seven Coimbatore hybrids, viz., X6752-B, X7795-C, X8016-6-C, X8074, X7786-A, X7682-24 and X4466, which had recorded longer staple and higher ginning values than H.A. 11 at Siruguppa. In the progeny row tests only seven out of three hundred and fourteen held out a fair promise of exceeding the control on visual scoring. It was gratifying to note that three long staple interspecific back crosses from Surat, viz., B.C. 22-1-1-1-3 (B.C. 125 × Co. 2) -3-3, and B.C. 68-5-4-1-1 proved to be on a par with H.A. 11 in yield. Possibly this is the first record of successful exploitation of synthetic polyploidy in cotton. The data collected on time of sowing trials extending over a long period from August to June, clearly indicated that August was the best period and the decline thereafter was progressive leading to zero yields in January and February sowings. The control variety once again demonstrated its superiority over others in the matter of (1) standing up to high moisture in the early stages, (2) resisting drought in the late stages, (3) plant vigour, (4) general productivity, (5) freedom from diseases and pests and (6) good fibre strength. One other feature that emerged out of the seasonal trials was its extreme adaptability and capacity to yield on the high side irrespective of the month of sowing. It is to be considered as an indispensable trial since cambodia sowings under the project conditions are likely to be protracted on account of turns for irrigation and inclement weather. Another encouraging indication was the possibility of isolating an American type suited to irrigated mungari season in place of the existing stenosis susceptible V. 434 declared to be the best on the Agricultural Research Station, Siruguppa. On closer examination H.A. 11 was found to be variable and likely to respond to re-selections for staple. The single plant selections made will be tested during next year. In the rainfed yield trials derivatives of Dharwar-Americans and their hybrids were the best. They however lacked staple and with the object of improving this defect, large scale crossing was done. The crossed material has been sown at Palur during March in order to speed up one generation. A rough comparison of the same material in all three centres indicated the existence of a tremendous variation in length, ginning and bad kapas content brought about more by the differences in sowing time than by other environmental factors. Another interesting observation which is sought to be confirmed by experiments is the pronounced competition effect leading to increased yields in Hagari 1 whenever it happened to be grown near another American variety. Such a behaviour has necessitated the exclusion of Asiatic control in the preliminary stages of rainfed breeding experiments. The phenomenon is capable of exploitation and being adopted as a farming practice in order to augment the normal yields and quality of the 'Westerns' cotton.

14. *Agricultural Research Station, Hagari.*—The breeding work on 'Westerns' cotton was concentrated on the examination and analysis of hybrid material in various generations. The variety is usually associated with high waste in blow and card rooms and as such this defect was included as a selection character along with other attributes, viz., yield staple, ginning, earliness and resistance to drought. The bigger yield trials consisted of forty-three hybrid derivatives. On analyses, seven cultures were found to be significantly better than H. 1 while the rest with the exception of an odd culture proved to be on a par with control. It is rather a pleasant coincidence that all the seven productive families are derived from triple hybrids involving two improved Madras *herbaceum* strains, viz., H. 1 and 2919, and one other extra-provincial strain 1027 A.L.F., B.D. 8 or Jayawant as parents. Six of the seven cultures mentioned above yielded better than control in Family block also but two of these had to be discarded on the score of poor fibre qualities. In addition, 13 other families were superior to control and they await laboratory examination. All the desirable lots will be further tested in comparative trials during the next season for ascertaining their relative merits with regard to productivity, staple, ginning percentage and earliness. Among the cultures in advanced stages of trials, 2551 constitutes an improvement over H. 1 in yield and ginning percentage and deserves trials for adaptability and quality in the districts. The statistical analysis of 139 progenies tested in row yields was yet unfinished. A very high selective value of 35 per cent was obtained in the second generation crosses between H. 1 and 1027 A.L.F. or Broach types. A fresh batch of 94 direct, back and multiple first generation hybrids was raised and harvested. A total of 711 new crosses with early high ginning *herbaceum* strains from Viramgam was effected to improve the ginning percentage further.

15. *Agricultural Research Station, Nandyal.*—Selection work has so far failed to improve the previous release, viz., N. 14. The Northern tracts are noted for the low yields, poor ginning and the coexistence of a multiplicity of varieties in a small total area. Breeding experiments should aim at the elimination of these defects. The year was characterised by poor and delayed rains leading to a belated sowings and subnormal yields. Since N. 14 and Gadag formed the two main varieties popular with the cultivators of the tract, both were included as controls. None of the cultures except x20 was superior to Gadag in yield in the comparative trials at Nandyal and district trials at Pattikonda. Twelve hybrid families derived from 1523 parentage equalled N. 14 in yield and staple but excelled it by about 8 per cent in ginning outturn. After analysing for the purity, the desirable families will be tested in bigger plots. Very promising material capable of ultimately replacing local Gadag though not N. 14, was present in the Family block group. Out of 462 progenies under replicated trials, 103 progenies were found to be improvements on

Gadag for staple and ginning. Hybrid families from 1523 × 52-2 and (4714 × 1539) × L. 3-10 grown on the black soil at Coimbatore were sown for observation. Of these 7036, 7111 and 7070 combined quality and ginning. There was no variability in the second generation crosses with N. 23. Eighty-five crossed bolls were raised as F. 1 and harvested. The available information on the local varietal collection showed that x20 possessed capacity for yield, N. 14 had the finest quality and 1523 combined staple and ginning. Hence new crosses introducing one or more of the three parents were made for supplying highly variable breeding material.

16. *Agricultural Research Station, Koilpatti.*—The spread of strain K. 1 was limited to the Karunganni zone. It was not popular with the section of farmers growing Tinnies or Uppam who favour their retention on three grounds, viz., high susceptibility of karunganni to shed during untimely February rains, low mortality due to root rot, and a close harvest period. Of late, the spinning reports of K. 1 showed a certain amount of deterioration in quality and indicated the need for improving the staple and fineness of the strain distributed in the area. During the year, twelve trials with four new cultures were laid out in the Tinnevely district in addition to other yield tests conducted in the southern districts. The yield trends of the variants subjected to the tests were: (1) 4706—a reselection from N. 2-2/13 evolved in the Madras *Herbaceum* scheme—was definitely good in the Uppam zone and on a par with K. 1 in Tinnies and karunganni areas; and (2) 4829 and 5090 were as good as K. 1 in Karunganni zone. Since 5090—a reselection from P.B. 72—was as coarse as K. 1, the choice naturally narrowed down to 4706 and 4829 which were finer. In this connexion, the natural spread of N. 3-2/13 under the name of 'ottuparuthi' in the Udumalpet taluk of Coimbatore district has to be considered as additional evidence regarding the suitability of 4706 for *upparuthi* zones. The available record of its performance over a range of seasons and places is entirely in favour of its immediate distribution in order to quicken the pace of replacement of inferior *upparuthi* in the southern districts. Among the purified biotypes in the preliminary stages of trial, six reselections from 4893, 4429 and P.B. 72 were superior to K. 1 in yield and quality. Two families, viz., 5390, (3395 × by K. 1) and 5490 (A. 10 × P. 26 H.) yielded more seed cotton, recorded less wilt incidence and contained low residual genetic variability. Three hundred and fifty biotypes selected from the diverse second generation hybrids were under replicated progeny row tests. One hundred and fifty-four of them had to be rejected in the field on account of delayed germination, high wilt incidence, poor bearing and late maturity. Among the rest, 46 biotypes satisfied test of significance for yield and they were derived mostly from crosses between K. 1 or C. 7 with 4429, P.B. 72 or 546. The determination of their lint characters was in progress. Selection in the

variable lots of fresh hybrid material yielded 1,315 desirable single plants. In addition to effecting new combinations with later type collections, another batch of forty-one first generation hybrids was harvested. On account of heavy rains and wet weather during the growing phase, the incidence of *rhizoctonia* was comparatively high. The relative mortality data, however, indicated that all the four cultures tested in the districts were more resistant than K. I while 546 reported to be hundred per cent resistant during last season broke down to the level of control.

17. *Miscellaneous*.—I continued to be a member of the Indian Central Cotton Committee, Bombay and Cotton Purchase Committee, Central Jail, Coimbatore, and served as Secretary of the Provincial Cotton Committee and Research Council and attended the meetings.

COIMBATORE,
29th August 1945.

R. BALASUBRAMANYAM,
Cotton Specialist.

ADMINISTRATION REPORT OF THE MILLET SPECIALIST FOR THE YEAR ENDING JUNE 1945

I submit the administration report of the Millet Specialist for the year ending June 1945.

2. *Charge*.—Sri C. Vijayaraghavan continued to be in charge of the Millet Section during the entire period of the report.

3. *Tours*.—The Millet Specialist was on tour for 84 days in the year of which 50 days were spent in inspecting the work of the Millet Assistants posted at the district stations, 25 for investigating the type of millets required for the respective tracts and nine for attending the meeting of the Pulses and Millet Committee of the Imperial Council of Agricultural Research at New Delhi. Five members of the staff were away from the headquarters for 60 days in connection with the conduct of experiments in the districts and for helping the district staff in the roguing of seed multiplication plots.

4. *Education*.—The final year students of the B.Sc. (Ag.) visited the Millet Breeding Station in November 1944. They were given practical field instructions on the variation in Sorghum and simple Mendelian segregations of plant characters. In January 1945 a party of 19 Army Officers was given a short lecture of the knowledge that is recorded about millets illustrated with specimens. Later a precise of the lecture was also prepared and given to each of them.

5. *Visitors*.—There have been many visitors who were taken round the section or the Millet Breeding Station, when the work in progress and also the achievements so far attained, were explained to them. Of them mention is made here of His Excellency the Governor's Advisers Messrs. G. W. Priestley and S. V. Ramamurthy and of Doctors Ma and Chiah of the Chinese Veterinary Mission.

6. *Exhibitions*.—Millet exhibits consisting of charts and samples of strains were sent to six exhibitions organized by the department. The millet strains exhibited in the Central Industrial Museum were also replaced with fresh material. The Army Agricultural Show Centre at Bangalore was provided with a set of exhibits consisting of the strains produced from the section in comparison with the unselected cultivators' seeds.

7. *Publications*.—Six contributions were made to the "Mezhichelvam", four of them on the improved millet strains evolved at the Coimbatore and other districts, one on the process of making dishes out of the millets suited to the town dwellers' palate, and another on the method of treating the seeds of *Prosois juliflora* for good germination. Five maps of the Province showing the

area of the millets—sorghum, *cumbu*, *ragi* and Italian millets were prepared and sent for publication in the Tamil and Telugu Monthlies of the department.

8. *Research Council*.—Three meetings of the Research Council were attended, when the half-yearly reports were discussed and passed. Besides, the annual reports, the cropping schemes, programmes of work of the Agricultural Research Stations and the schemes of work of sugarcane agronomy which came in circulation were scrutinized and passed to the next officer with the remarks of the Millet Specialist.

9. *Improvement of the millets at the district stations*.—A note summarising the work that was in progress at the stations of Anakapalle, Guntur, Nandyal, Hagari, Siruguppa, Palur and Koilpatti where Assistants in Millets are posted is given separately as an appendix.

10. *Sorghum*.—In the monsoon period of 1944, Sorghum was grown in an area of 19.54 acres and in the following summer with irrigation in an area of 6.10 acres. As in the previous year, for want of sufficient area with irrigation, two yield trials of irrigated sorghum had to be sown in 1.30 acres of the Central Farm. Besides, the seed multiplication plots of the strains A.S. 389, A.S. 809, A.S. 1543, A.S. 2095, A.S. 3316 and A.S. 7244 were also sown in the Central Farm. The season was favourable for the sowing of the rainfed crop. The later rains also resulted in a good growth. But as heavy rains occurred between the latter half of October and the middle of December, the plants lodged and the grains got discoloured and mouldy resulting in poor viability of seeds. The types with loose ears were not so badly damaged as those with compact ones.

11. *Improved strains*.—To the list of thirteen strains that have been spreading in the districts one more has been added in the year. It is A.S. 7244 a strain of *Mottai Vellai Cholan* the variety that is grown in the Udamalpet area both on the dry land and with irrigation in the early south-west monsoon season. Ten of the strains have been very popular. A total quantity of 16,495 lb. of seeds have been distributed to the district officers. This figure is less than the previous years as seed distribution schemes of a few of them have been started. For the use of primary seed farms, 1,200 lb. of A.S. 29 *Periamanjai cholam* were supplied in July 1944. Similarly for the A.S. 2095 primary seed farms 2,000 lb. of pure seed was transferred to the District Agricultural Officer, Coimbatore, in February 1945. To rogue the seed farms, the services of the staff of this section were made available to the district officers. While there have been attempts to spread the 14 strains wider still, work was also in progress to evolve strains that would be further improvements over the existing ones, as well as those that would suit the tracts in which the existing ones have not been acceptable.

12. In the main rainfed season 1,358 cultures, which by their being in replications were grown and studied in 2,548 plots. In the irrigated crop 427 cultures raised in 1,113 plots were under study. Most of them were for the evaluation of their economic worth in comparison with the respective local varieties.

13. *Periamanjai cholam*.—The strain A.S. 29 of this variety of sorghum is popular and a seed distribution scheme is working in the Coimbatore district. Although a heavy yielder, some cultivators would like in it a reddish glume and reddish pigment on its sheath, for the straw with the blackish pigment is considered inferior to the one of reddish colour. With a view to evolve a strain yielding as heavy as A.S. 29 with the reddish pigment on the glume and sheath, seed collection was made in twenty villages of the Coimbatore taluk. Fourteen samples obtained had reddish glume and six others were of the black. In the course of earlier studies, it has been noted that *Periamanjai* with black glume has always been yielding higher than the one with red glume. Therefore, the fourteen red glume samples were studied with replications with six older selections of the red glume group. The new six with black glume were compared with A.S. 29. In the latter none of them excelled the standard strain, and therefore were rejected. In the red glume group there was no significant difference among the samples. In the order of yield figures the first twelve have been retained for a second trial. To effect improvement in A.S. 29 itself, it was crossed with A.S. 3596, a promising type with red glume. The hybrids were raised in 1944 and seven selections have been taken to grow the F-2 populations. There have been attempts to increase the grain size of A.S. 29. With this end in view, it was crossed with *Sorghum caffrorum* of Africa. From the progeny of this, 25 selections with pithy stem and 30 with juicy stem were sown in compact family blocks. None of them was an improvement in yield over A.S. 29 the standard.

14. *Periamanjai cholam for the Dharapuram tract*.—The dry land yellow grained sorghum grown in the Dharapuram taluk and in parts of the Palladam taluk adjoining it though *Periamanjai* is different from the type grown in the Coimbatore and Avanashi taluks. The strain A.S. 29 is not suitable to the former tract, where the *Periamanjai* has a short duration with looser ear. Three promising selections compared in yield trials of 1942 proved their superiority over the local. The trial repeated in 1943 was not a success as the season was adverse to sorghum. In the year 1944, a third trial was conducted, when only one of them, A.S. 6877, yielded more than the local. This will be tried in that tract under cultivators' conditions.

15. *Improvement of Periamanjai cholam fodder*.—Though the *Periamanjai cholam* has pithy stalk, because of its high yield, it is a very popular variety for raising fodder not only in Coimbatore

but also in the adjacent districts. With a view to obtain types with sweet and juicy stalks, A.S. 29 was crossed with A.S. 3355 (a long duration fodder strain with sweet and juicy stalk) and A.S. 4854, a juicy yellow grained type isolated from a cross between *Periamanjai cholam* and T. 12—*Tella jonna* of Bellary. From the F. 3 progeny of these crosses, nine selections were compared in replicated rows. Ninety-two further selections from segregating families were also studied in single progeny rows. In the row yield trials, the straw yield differences were not significant, therefore five of them in the order of yield have been retained for further study. From the 92 in the single rows, 43 segregated for pigmentation and three for duration. From the remaining that was pure, 156 selections from 26 progenies have been taken for further trials.

16. *Talaivirichan cholam*.—In this variety, the strain A.S. 3313 has been the best yielder at the station and also in the trials outside. It has been in general distribution in parts of the Chittoor, North Arcot, Salem, South Arcot and Trichinopoly districts. This strain has chalky white grain. There is a preference for a pearly white grain in the parts of the Salem, North Arcot and Chittoor districts, as it has a better keeping quality than chalky white grain. Attempts have been in progress at the station to evolve a high yielding strain with pearly white grain. Three pearly grained selections from Chittoor, Gudiyattam and Tirupattur (North Arcot) were tried in 1942 in comparison with A.S. 6183, a selection from *Muthyala jonna* of Hindupur. None of the selections yielded more than the standard. The trial was repeated in 1943, but it was a failure due to adverse season. In the trial conducted in 1944, A.S. 6183 gave higher yield than all the other selections. There have been attempts to get at a strain that will yield still higher than A.S. 3313. This year the yield trial for a third time with chalky white grain types showed that A.S. 3313 was still unbeaten both in grain yield and money value of the produce. In addition to the yield trials, whose results were dealt with above, fresh materials collected from the districts and the selections that were kept by in the previous years were grown in replicated bulk plots, family blocks and progeny rows, according to the nature of the seed material. Of the 30 new samples, 17 had pearly grains and the rest chalky. Among the 23 families from the previous selections, 12 were of the pearly grain group. The pearly grain groups were sown in four sets of trials with A.S. 6183 as a standard. The chalky white grain groups, in an equal number, were also grown in comparison with A.S. 3313. From the pearly group, four fresh samples and two families were significantly superior to the standard and they were taken for further trials. In the chalky group, as in the previous year, the standard was unbeaten. In the progeny rows, two selections which were superior to A.S. 6183 have been selected for further examination. Thus for the next season there is a good amount of promising material for yield valuations.

Sorghum conspicuum, though in most of the morphological characters similar to the *Talaivirichan*, has a bolder and more attractive grain than the latter. Should it yield equal to *Talaivirichan*, it would become popular. Therefore, four of the most economic types of *Sorghum conspicuum* were grown in yield trials with A.S. 3313. None of the *S. conspicuum* types yielded as well as A.S. 3313. To improve the grain size of *Talaivirichan*, four of the selections that have been in the yield trials were crossed with five bold grain *Sorghum conspicuum* types. From the 35 crossed ears, 50 F.1s have been selected to raise F.2s. The *Talaivirichan cholam* has a straw of poor quality. Only the top half is used for feeding in some locality, while in some places it is treated as fuel. Of late, there has been a demand to improve its fodder quality. Consequently, to evolve a type with sweet juicy stalk, crosses were made with A.S. 1093, a juicy stalked *Talaivirichan*. In 1943, 20 selections from the F. 3 progeny were sown in family blocks. All of them failed in that year. The balance of seed that was available was sown in this year for row yield test with A.S. 7463, a juicy stalked *Talaivirichan* mutant, as standard. All except one were poorer than A.S. 7463.

17. *Dry land red grain sorghum*.—When the season is late, a variety of red grain sorghum is grown in the Dharapuram and neighbouring taluks of the Coimbatore district. During the year, the yield worth of two selections were compared for a third time. Both the selections were superior again to the local sample of the variety. Which of the two is preferable will have to be decided hereafter by district trials.

18. *Makkattai cholam for the Trichinopoly area*.—In the Perambalur and Ariyalur taluks of the Trichinopoly district, two varieties of sorghum *Manja makkattai* and *Vellai makkattai* are grown on the dry land. The strain A.S. 29 was found to be unsuitable to the tract. Therefore, selection work has been in progress from the collection made from that tract. Four promising selections of the two grain colour groups were compared with the respective locals. The yield of *Vellai makkattai* selection was not statistically higher than the standard, and in the case of the yellow grain selections, none of them yielded higher than the local.

19. *Irrigated sorghums*.—The irrigated sorghums consist of red, yellow and white grained varieties. Six improved strains A.S. 389 (red), A.S. 809 (yellow), A.S. 732, A.S. 1543, A.S. 1575 and A.S. 2095 (white) have been evolved and, after successful trial in various localities, they are spreading in tracts where they are superior to the local types. As these strains do not cater to the needs of all the important tracts, further work has been in progress in the following varieties.

(a) *Mottai vellai cholam*.—This variety, grown in the Palladam and Dharapuram taluks of the Coimbatore district, is one of the shortest in duration among the local irrigated sorghums. Four

selections of this variety, the best from the trials of 1942-43, were grown in the summer of 1944 under comparative yield trials with the Dharapuram local variety as the standard. One of the selections A.S. 7244, which was the highest yielder in the previous trials, behaved similarly in this season also. In the trials conducted on the ryots' fields too, A.S. 7244 gave consistently higher yield than the local types; therefore, it has been declared as the best *Mottai vellai cholam* strain.

(b) *Chitrai Vellai cholam*.—Widely grown in the taluks of Palladam and Udumalpet, this variety has tall, slender and leafy plants with fairly large ears and bold chalky white grains having black glumes. It matures in 85 to 90 days. Three selections of this variety were sown in yield trial plots in 1944 summer with a local sample from Palladam as the standard. One of them A.S. 7562 gave a significantly higher yield than all the rest. All the three selections and another *Vellai cholam* selection advanced from row yield tests were sown for yield trial in 1945 summer with the same local sample as standard. The results are not yet ready and therefore will be submitted in the next report. In addition to these, four selections from each of the six families with black glume were sown in compact family blocks in 1944 summer with A.S. 732 as standard. As none yielded more than the standard, they were rejected.

(c) *Karurettu Vellai cholam*.—This is generally grown in parts of the Pollachi, Palladam, Udumalpet, Bhavani, Gobichettipalayam and Coimbatore taluks and is similar to *Chitrai Vellai cholam* except for its more open panicle. Forty selections were sown in 1944 summer in family blocks with a bulk sample from Palladam as standard. Every selection was later than the standard and only one of them gave more yield than the standard. This and two others equal to the standard were selected and sown in 1945 summer with A.S. 732 as standard. The results will be discussed in the next report.

(d) *Vellai cholam*.—Two families of *Vellai cholam* of Coimbatore and Avanashi and 36 selections from nine families obtained from the F3 generation of the crosses between A.S. 5142 (Club Kafir) and A.S. 732 were tried in 1944 summer in compact family blocks with A.S. 732 as standard. All the selections were poorer than A.S. 732 and hence rejected. From the three fresh samples of *Vellai cholam* from Dharapuram sown in progeny rows in 1944, one was selected and sown for yield trial along with *Chitrai vellai cholam* in 1945 summer.

(e) *Kittan cholam*.—Two selections of *Kittan cholam*, a variety grown in the irrigated and rainfed lands of the Pollachi taluk were grown in 1944 summer in comparative yield trials with an unselected bulk of the same variety as standard. In money value of the produce, both the selections were significantly superior to the standard. Both the selections were sown in comparative

yield trial in 1945 summer for a final test. The results will be discussed in the next report.

(f) *Irrigated sorghum for the Madura tract*.—The Madura district has a large concentrated area of irrigated sorghum in the Nilakottai and Periyakulam taluks. From the collections comprising the three prominent varieties of *Vellai cholam*, *Salangai Vellai* and *Azukku Vellai*, five of *Vellai cholam* and nine of *Salangai Vellai* and three of *Azukku Vellai* were sown in comparative yield trials in 1944 summer with their respective local samples as standard. A.S. 2095 was also included in the *Azukku Vellai* group. The results show that one selection of *Vellai cholam* two of *Salangai Vellai* and all the selections of the *Azukku Vellai* group were significantly superior to the respective standards. The trials were repeated in 1945 summer. The results will be discussed in the next report. Eight selections of two families of *Salangai Cholam* were sown in compact family blocks in 1945 summer with the local *Salangai* sample as standard. Only one selection of a family gave higher yield than the standard.

(g) *Sen cholam*.—A.S. 389 is the highest yielding strain of this variety, but its grain is not as bold as that of the local variety of the Salem district. From a large collection of samples made in the Salem and adjacent districts, 188 selections were compared in replicated rows in 1944 summer. Five selections from each of the 20 progenies of the Salem group and one of the Karur group were taken for repeating the trial in family blocks, and three selections of the Karur group for yield trial. The family block trials were not sown in the summer of 1945 for want of area under irrigation. Two old selections of the Salem variety and three selections of the Karur variety have been sown in yield trial plots in the summer of 1945. The results will be presented in the next report.

(h) *Improvement of irrigated sorghums by hybridization*.—A.S. 2095 is a very popular white sorghum strain because of its high yield and short duration. With a view to improve the grain colour of A.S. 2095 it was crossed with M. 47-3, A.S. 389 and A.S. 3834 (a juicy stem *Agnikodai Vellai cholam*). The F-2 of these crosses was raised in 1944 summer season. Twenty selections from the F2 progenies were taken and sown in compact family blocks in 1945 summer. The results of this trial will be presented in the next report. *Vellai cholam*, strain A.S. 1543, was crossed with A.S. 3834 and from its F2 progeny raised in 1944 summer, season, twelve selections were taken for purification. From the F2 and F3 progenies of crosses, A.S. 389 by A.S. 2095, and A.S. 389 × A.S. 6509 (a juicy stem mutant in *Sen cholam*) raised in 1944, ten red-grained selections from two progenies were taken for yield comparison and thirty-six selections from seven progenies for further purification. These were not sown in 1945 summer for want of area and irrigation facilities. A.S. 389, A.S. 2095 and A.S. 7586 (a yellow grain selection) were crossed with

sufr, a sudanese sorghum with very bold grain to improve the grain size of the local strains, and A.S. 2095 was crossed with A.S. 1543 to improve the grain colour. The crossed ears were sown in 1945 summer season to raise hybrids. To improve the fodder quality of the irrigated sorghum the following crosses were effected :—

A.S. 2095 × A.S. 3834
 A.S. 1543 × A.S. 3834
 A.S. 809 × A.S. 3316
 A.D. 389 × A.S. 6509

From the F2 and F3 progenies of these crosses raised in 1944 summer, selections were taken from seven progenies of white, three of yellow and two of red grain. Even these were not sown in 1945 for want of area.

20. *Improvement of irungu cholam*.—*Irungu cholam* is grown in the Mathurai district as a grain crop on the dry lands. It has small grains which are enclosed by the glumes. A bold grained type of this variety that could be easily threshed would be of great value in that tract. From a previous cross between *Periamanjol cholam* and *Irungu*, a bold grained *Irungu* type with yellow grains had been isolated. In order to get a bold white grained type this yellow type and another white type of *Irungu* were crossed with a few *Vellai cholam* types. Fourteen of these crossed ears were sown in the monsoon season of 1944, and fifty-one hybrid ears were gathered to raise the F2 generation.

21. *Improvement of kaki jonna*.—*Kaki jonna* is a vigorous and quick growing fodder variety cultivated in parts of Chittoor, North Arcot, South Arcot and Salem. It has a pithy stalk. To improve its fodder quality it was crossed with an American sweet sorghum having a very sweet and juicy stalk. Of the four hybrids got from this cross two were sown in the monsoon season of 1944, and seven selfed selections with juicy stalk and short duration were taken for further selection and yield tests.

22. *Striga Resistance Studies*.—From the progeny of crosses between A.S. 29 and the *Striga* resistant type A.S. 4003 (*Bonganhilo*) and A.S. 4693 (*Bilichigan*) 48 selections of *Periamanjol cholam* type were sown in replicated rows. In the progeny of these the incidence of *Striga* ranged from nil to 74 per cent while in the control plots of A.S. 29 it ranged from 45 to 62 per cent. Selections for further tests were taken from eight progenies, five completely free from *Striga* and three of less than five per cent incidence. The *Patsa-jonna* strains of Nandyal—T. 6, N.J. 29/68 and N.J. 28/3 have been crossed with *Banganhilo* to evolve *striga* resistant *Patsa-jonna* strains for the Kurnool and Cuddapah districts. Four types of *Cumbu* (*Penisetum typhoides*), two of *Tenai* (*Setaria Italica*) and one each of *Varagu* (*Paspalum scrobiculatum*), *Samai*

(*Panicum miliare*) and *Kudiravali* (*sechinochloa framentacea*) were sown, a line each in a plot infected with *Striga* seed collected from a sorghum crop. In the progeny of these, excepting *Cumbu*, all the others were subject to the attack of the parasite. In the above plot *Striga* was observed attacking a few grasses also. *Striga lutea* was observed on *Brachiaria erusiformis*, *Grisel* and *Tragus biflorus*. *Schult* and *S. densiflora* on *Dinebra retroflexa*, *prauz* and *Eragrostis ylumosa*, Link.

23. *Calocoris Resistance Studies*.—In the 1943 monsoon season (July-December) A.S. 6616 a selection from a cross between *Periamanjol cholam* of Coimbatore and *Kara wiru*, an African Sorghum with small brown grains, was observed to be free from *Calocoris* attack while *Periamanjol cholam* was badly damaged by the bug. A.S. 29, A.S. 3313 and A.S. 6616 were sown about the end of July, 1944 (normal sowing season) and six weeks later about the middle of September. There was no *Calocoris* attack in any of the early sown plots which flowered during the last week of October. In the later sown which flowered in the last week of November there was *Calocoris* damage. Periodical counts of *calocoris* were taken. It was observed that the *Calocoris* damage was severe in the A.S. 29 late sown plot, while in the late sown plots of A.S. 6616 and A.S. 3313 it was comparatively less. In the 1945 summer season incidence of *Calocoris* was observed only in the ear heads which flowered after the 20th of May. In these two to five adults and ten to twenty nymphs were noted per ear-head, when examined about the end of May. Ten days later it was observed that the population of the bugs had increased to about 20 adults and 50 to 70 nymphs per earhead. The insect population was comparatively less in very compact earheads. In the *Punasa* (early south-west monsoon) season of 1944, twenty-five short duration varieties of sorghum were grown in small plots at Narasaraopet (Guntur district). The *Punasa* crop was grown in this area by the first week of July. Even though the sowing was done rather late *Calocoris* attack was not severe in the year. Of the 25 varieties tried there, 14 which were earlier than the rest and contemporary to the local sorghum escaped *Calcoris* attack and set seed satisfactorily.

24. *Comparison of sowing seed with the transplanting of sorghum seedlings*.—The experiment started in the summer of 1942 to compare the practice of transplanting (as found in parts of Chittoor, North Arcot, Salem, Trichinopoly and Madura districts) with the common method of sowing the seeds direct was continued in 1943 and 1944. As in the previous years, the control (sown direct on the date of transplanting the seedlings) gave the highest outturn and proved to be the most economical. It may be concluded that, when facilities exist it is more paying in sorghum to sow the seed direct than transplant the seedlings.

25. *Threshing experiment*.—The object of this experiment was to compare the practice of threshing *cholam* earheads soon after

harvest with that done after drying. It was started in the summer of 1942 and repeated in 1943 and 1944. The variety used was the compact eared *Vellai cholam*. In 1942 and 1943 it was found that the dried ears required less time to thresh than the fresh. In 1944 the dried ears gave significantly higher yield of grain than the fresh. It is clear that it is easier and more economic to thresh the earheads after they have been completely dried.

26. *Fundamental studies*.—From a cross between two African sorghum varieties—one having a clear purple colour in the ovary wall and the other without it, it was found that the purple colour was visible only just at the flowering stage and that it was a simple dominant to its absence. It was linked with sheath, midrib, axil and grain colours. F3 generation raised in the monsoon season of 1944 confirmed this behaviour. Eight crosses were made to study the inheritance of glume shape and texture, fertile pedicelled spikelets, tucked up anthers and purple coloured grains. In the F-2 generation raised in 1944 the coriaceous glume was observed to be a simple dominant over the papery type. The segregation for glume shape was not clear. The pedicelled spikelet was recessive to non-antheriferous and antheriferous groups. The segregations for tucked up anthers and purple coloured grains were not clear.

27. *Trial of strains in the districts*.—A.S. 389 *Sen cholam* strain was tried in 1944 summer in three villages of the Pulivendla-taluk (Cuddapah) and was reported to have yielded 850 and 80 per cent more grain than the local sorghum. In one place the yield of grain was 3,456 lb. per acre. This strain was also tried in three villages of the Lalgudi taluk (Trichinopoly). In two of them the crop was damaged by heavy rains and insect pests. In the third place the strain was reported to have yielded 17 per cent more grain than that of the local. The *Talaivirichan cholam* strain A.S. 3313 has been under distribution in parts of Chittoor, North Arcot and Salem districts. It was given for further trial in other tracts of these districts and also in those of South Arcot and Coimbatore. In addition to A.S. 3313 two more strains A.S. 1093 and 6183 were also given for trial. From the results received it is found that the strains gave 48 to 75 per cent more yield than the local in Ariyalur and Gudiyattam, but 6 to 7 per cent less in Vriddhachalam. The plots of the other centres failed due to adverse weather. The trials will be repeated in those taluks where they failed. Nearly 1,000 lb. of seed of A.S. 3313 was issued for distribution in the South Kanara, Coimbatore, South Arcot, Salem and Chittoor districts.

28. *Seed Multiplication Schemes*.—For multiplying seed in seed farms, 4,200 lb. of seed of *Periamanjai cholam* strain A.S. 29 was supplied in July 1944 and 2,000 lb. of seed of *Vellai cholam* strain A.S. 2095 was supplied in February 1945 to the District Agricultural Officer, Coimbatore. A fieldman was deputed to help the Agricultural Demonstrators, Palladam and Erode, to rogue the

seed farm plots of A.S. 2095 sown in their respective taluks. A fieldman employed in the A.S. 389 Seed Multiplication Scheme of the Musiri taluk was trained for ten days to rogue cholam seed farm plots and a fieldman from the staff at Coimbatore proceeded to Musiri to help him to rogue the seed farm plots of A.S. 389.

29. *Cumbu (Pennisetum typhoides)*.—Two crops were raised in 1944. There was an irrigated crop in the summer and a rain-fed one in the north-east monsoon season of 1944. In the April of 1945 an irrigated crop was raised to study the hybrid vigour material. In the summer of 1944, thirty-three cultures were grown in 62 plots and the next monsoon crop had 91 cultures in 575 plots.

30. *Improved strains*.—The three strains P.T. 367, P.T. 700 and P.T. 2229 continued to be popular. The District Agricultural Officer, Coimbatore, has arranged for their large scale multiplication in seed farm conditions. The necessary seed for the seed farms were multiplied in $1\frac{1}{2}$ acres of the Central Farm.

31. *Yield trials*.—The monsoon crop of 1944 had two yield trials. In the first, three short duration selections of Namakkal (Salem) and Cheyyar (North Arcot) were tested for a second time with P.T. 760, *Yemarappa sajjai* of Rajampet as standard. One of the Namakkal selection, P.T. 786, gave significantly higher yield over the standard by 19.5 per cent. In the second, five medium duration selections of Perambalur were studied in comparison with P.T. 367. One of the five selections, P.T. 809 gave very encouraging results as it was significantly superior to the standard by 18.7 per cent in grain yield and 52.3 per cent in straw value.

32. *Row Yield Trials*.—There were three groups of row yield trials with replications. They comprised of 28 cultures from the districts of Nellore, Chittoor, Tiruchirappalli and Madura. In comparison with P.T. 367, the highest yielding standard, none of the selections was good for further study.

33. *Production of hybrid seed by growing them mixed*.—Being an essentially cross fertilized crop it was thought possible to improve the yield of *Cumbu* by mixing the high yielding strains and allow them to get cross fertilized among themselves. It was started in 1942. P.T. 367, P.T. 504 and P.T. 700 were mixed in different proportions and sown in comparison with pure strains. The results once again show that P.T. 367 grown pure has the highest yield. Evidently this method is not a success in the local conditions.

34. *Improvement of yield by the use of hybrid vigour*.—With the object of seeing how far it would be possible to make use of hybrid vigour in increasing grain yields of *Cumbu*, fifteen crosses were made in 1943 among the nine selections that were in preliminary yield trials and the two standard strains P.T. 700 and P.T. 367. The crossed ears were sown in 1944 summer with irrigation along with their parents. The hybrids were compared with the parents with regard to plant height, ear length, ear weight, and grain weight and in all of them the differences between the hybrids

and their parents were statistically significant. In three out of the fifteen crosses the hybrids showed a higher grain yield than that of both their parents, the increases ranging from 17 to 162 per cent. In five crosses the grain yield of the hybrids was greater than one of the parents only, and in the remaining seven crosses the hybrid plants gave lower yields than both the parents. To verify and confirm these indications, 38 further crosses were made in the main season of 1944 and the hybrids have been sown with irrigation in April 1945. The results will be dealt with in the next report.

35. *Comparison of raising cumbu by transplanting seedlings with that by sowing seed.* This experiment was conducted for the third time in the summer 1944. As in the earlier two years the strain P.T. 2229 was used for the trial. The transplanted crops with two and three week old seedlings gave higher yields than the control raised by sowing the seed on the day of transplanting the seedlings. But the extra yield of grain or the money value of the produce was not equal to the extra cost of transplanting. This result was in agreement to the 1942 results. In 1943, the extra yields by transplanting compensated fully the additional cost of cultivation. Therefore for the conditions at Coimbatore raising a crop by sowing seems to be the correct practice.

36. *Ragi (Eleusine coracana).*—There was only one crop or *Ragi* in the year, and that was in the monsoon season of 1944. An area of 2.31 acres was planted with *Ragi*. Three hundred and thirty-seven cultures were studied with replications in 1,293 plots.

37. *Improved strains.*—The three improved strains E.C. 593, E.C. 3517 and E.C. 3735 continued to be popular. With a view to know their suitability in fresh tracts there were a few district trials of which in the one conducted at Dindigul E.C. 3517 and E.C. 3735 showed superiority over the local to the extent of 53.7 and 35.7 per cent respectively.

38. *Yield trials.*—There were three sets of yield trials, the first with five derivatives of X-ray progenies which yielded higher than the untreated control, E.C. 593, in the preliminary yield tests, the second with short duration varieties, and the third with white grain types. In the case of the first set it was a second year trial. The results showed that X 303 maintained its superiority this year also over the control, and is followed by X 306 a place held by X 305 in the last year. In the second set five selections of 110-day duration were compared with E.C. 3517. The results of this trial showed that none was better than the control in yield. In the third set five white grained varieties were compared with E.C. 1540. This was also a second year trial. In this year too E.C. 4456 was superior to E.C. 1540 in grain yield. E.C. 4301 which was better than the control last year was not so in the second year.

39. *Progeny rows.*—There were two sets under study, five were of brown grains and five others of white grains. The former had E.C. 3517 as control, while the latter were compared with E.C. 1540. Five of the brown grain group and two with white grain which were definitely superior to the respective standards, have been chosen for the yield trial in the next season.

40. *Family blocks.*—Nine families of *Karumsurattai ragi* of Tiruvannamalai were studied with the object of evolving a high yielding type of this variety, as the cultivators of that tract want pigmented ragi with incurved ears. Compared with the standard E.C. 3517, one of the families M.S. 4867 was just significantly superior to it, and in the family the eighth and fourth sibs were very promising for yield.

41. *Less than 110-days Ragi.*—To evolve a good yielding type of less than 110-days duration further selections have been in progress. From the Central Farm bulk plots of E.C. 3517, 24 earlier plants were selected. These were sown in the monsoon season. In the order of yield nine of them have been taken for yield test.

42. *Hill Ragi.*—At the Agricultural Research Station, Nanjanad, four bulks were studied, two of the Coonoor variety, and two of Nanjanad, with the Nanjanad cultivators' seed as standard. This procedure was followed to get at a high yielding bulk as there are no facilities to evolve a pure line strain. The two Coonoor bulks were significantly superior to the local. In this year also attempts to grow the hill ragis at Coimbatore were unsuccessful and they failed to set seed.

43. *Italian Millet (Setaria italica).*—In the period of the report there were two crops, one in the north-east monsoon season of 1944 in an area of 6.88 acres and another in 0.49 acre with irrigation in the summer of 1945. On the whole 696 cultures were studied in 3,687 plots. S.I. 523 has been the improved strain of this millet for the Coimbatore district. To see if it could be suitable to the adjoining Salem district, replicated trials were conducted with the help of the district officers in the taluks of Namakkal, Tiruchengode, Attur and Hosur. Significant results were available only from the trials at Attur, where the strain yielded 23 per cent more than the local. The results of the two previous seasons at the Millet Breeding Station showed that S.I. 3223 was likely to be a further improvement over S.I. 523. To test this in cultivators' conditions also seed was sent to the district officers for trial in the taluks of Avanashi, Bhavani, Erode, Coimbatore and Pollachi. The results are awaited.

44. *Yield trials.*—There were three sets of yield trials. In the first set S.I. 3223 was compared with the standard strain S.I. 523 for the first year. S.I. 3223 yielded again significantly higher grain,

straw and money value return than the standard. When the results of the three years were examined, it was noted that the varietal differences between the two were significant and therefore it is declared that S.I. 3223 is superior to S.I. 523. The second set of trials consisted of eight selections that were significantly higher yielders than S.I. 523 in the replicated row yield tests of last year. They were from the collections of the taluks of Dhara-puram, Pollachi and Kollegal. There were two standards, as S.I. 3223 also was included. None of the selections were superior either to S.I. 523 or S.I. 3223. In the third set of yield trials there were eight selections belonging to the Salem district in comparison with S.I. 523. These eight have been the result of comparative trials of 15 Salem selections picked as the highest yielders from 446 selections studied in 1943. The analysis of the results of the year show that all the eight have been superior to S.I. 523.

45. *Family blocks*.—There were two sets of family block trials, one with selections of the Coimbatore district, another of the Trichinopoly district. Both were of the few tillered varieties. In the Coimbatore set 81 selections in nine families were compared with S.I. 544 with six replications. None of the nine families yielded higher than the standard. In the Trichinopoly group, 108 selections in nine families were compared in six replications with the *ryots*' variety from Trichinopoly. Three of these families have yielded significantly higher than the standard, but within the families only one selection of family M.S. 5175 has given significantly higher yield than the general mean, the varietal differences in the other two families being not significant.

46. *Replicated Row Yield Tests*.—There were two groups, one comprising 87 selections of Coimbatore, and the other of 167 of Salem. The 87 selections were divided into eight sets and the 167 into 17 sets. Among the Coimbatore selections only six were statistically superior to S.I. 544 the standard, and of the Salem selections only one was significantly better than S.I. 544.

47. *To combine short duration and good yield*.—Thirteen crosses made for the evolution of high yielding short duration strains were sown in the north-east monsoon season of 1944. Of these only six germinated and from them only one F. 1 (S.I. 523 × S.I. 3197) could be obtained. Twenty-nine further crosses have been made between the 60-65 days duration good yielding S.I. 523 and the three short duration (41-55 days) selections.

48. *Rust Resistance Studies*.—Work on rust resistance in Italian millet with a view to evolving resistant strains was taken up this year. Sixty-six types were under observation in the rainfed season for their resistance to rust attack. Natural infection had to be depended upon in this first crop as the rust fungus cannot be propagated *in vitro*. The disease made its appearance in the second fortnight of November following the flowering stage about

eight weeks after the crop was sown. The average rustiness in each of the types was evaluated with the help of the scale used for estimating wheat rust. According to this estimate, the 66 types fell into the following classes:—

Average rustiness.						N per cent of types.
1-5	..	..	..	..	..	11
6-10	..	..	..	..	..	40
11-15	..	..	..	..	..	10
16-20	..	..	..	..	..	5
						—
						66
						—

The incidence of the disease, however, in all these types was 100 per cent, i.e., there was no plant in any of them that was entirely free from rust attack. In the summer of 1945, the studies were pursued by raising an irrigated crop of 52 new types along with the 11 that showed the minimum rustiness in the main season, as also 18 types selected as resistant to rust at the Dry Farming Station, Hagari. A 9×9 lattice design was adopted for the layout and there were four replications, two of group X and two of group Y. Germination in this crop was poor, particularly in replications 3 and 4 due to lack of sufficient water. Replications 1 and 2 were fairly satisfactory and pulled up at the later stages and produced a good crop. The first inoculation of the seedlings was given on the 26th March by spraying with the spore suspension, when the plants were three weeks old and 6—8 inches tall. A second spraying was given a week later, followed by a third inoculation by hypodermic injection of the border plants in each of the plots. No symptoms of the disease were however noticeable even after a fortnight and arrangements were therefore made with the Curator, Botanic Gardens, Ootacamund, for growing Italian millet at Ootacamund for rust infection. Accordingly 20 varieties were sown in pots in one of the glass houses in the Ootacamund Botanic Gardens in the second week of May. Germination was good and the seedlings came up well, and these were thinned during the last week of May. The thinned seedlings were, however, transplanted into another set of 20 pots. Inoculation of these seedlings sown as well as transplanted was done in the second week of June. Meanwhile, at the ripening stage of the crop at the Millet Breeding Station, rust was observed to appear in a severe form starting with the earlier varieties. Estimates of the attack in each plot were made as per the scale for wheat rust and the plots were harvested as they ripened and the grain yields recorded. Records of infection and yield were not taken in replications 3 and 4 since the stand in them were gappy and not uniform. The data of replications 1 and 2 considered as randomised blocks are being

analysed. A set of 20 varieties were grown in pots in the shade at the Mycologist's pot culture house of the Research Institute, and these were inoculated starting from the seedlings stage. No symptoms of the disease have however appeared in them although the plants have completed their flowering.

49. *The Setaria italica* × *Setaria Feberii* Amphidiploid.—A small quantity of seed of the amphidiploid *S. italica* × *S. feberii* brought from China by the Imperial Economic Botanist, New Delhi, was received for trial at Coimbatore regarding growth, flowering, seed setting and yield. As the quantity of seed was limited, they were sown in pots in September along with the strain S.I. 523 in similar pots for comparison. Germination was satisfactory and the plants grew up well, but the amphidiploid plants were smaller than the S.I. 523 plants. Their flowering started three weeks after sowing and the seeds began ripening a month after. They averaged a height of 45 c.m. compared to 125 c.m. for the Italian millet strain. The number of primary tillers per plant was 4 and the total number of earheads 9 as compared with 10 primary tillers and 15 earheads of the Italian millet variety. The flowering of the amphidiploids were in general similar to that of *Setaria italica*, but the flowers opened and anthesis took place between 8 a.m. and 12 noon, whereas in *S. italica* these are found to occur between 9 p.m. and 11 a.m. at Coimbatore. A typical main earhead took about a fortnight to complete its flowering. Seed setting of the amphidiploid was, however, extremely poor. Only stray spikelets set seed in each of the earheads. Counts made on six main earheads showed that while *S. italica* strain had an average number of 1545 spikelets per ear of which 1307 were fertile, in the amphidiploid only 14 spikelets out of 358 in an earhead set seed. The percentage of fertility is thus 3.9 in the amphidiploid compared to 84.6 of *S. italica* strain. The average yield of the amphidiploid per plant was only 60 seeds. Thus although the growth and flowering of the amphidiploid are satisfactory the seed setting has been extremely poor. It remains to be seen whether the fertility would improve in subsequent generations.

50. *X-rayed treated millets*—(a) *Cumbu*.—In 1943 sixteen selections were sown in two series of replicated row yields with P.T. 700 and P.T. 367 as standards. Ten of them were better than P.T. 700. In 1944 for a further trial, six of them in the order of good yield were grown in comparison with P.T. 700 and P.T. 367. The trial was laid in randomised blocks with replications. This being the end of the third year they have been under study. It can be concluded that X6-348, 350 and 351 have been consistently superior to P.T. 700 by about 20 per cent in all the three years. Besides this, in the summer of 1944 and in the following main season 59 and 86 cultures were under study for their behaviour of various characters induced by the X-ray.

(b) *Ragi*.—The result of the yield trials of the three X-ray derivatives have been dealt with in the section under *ragi*. Other studies on the X-rayed material were on the earliness induced by X-ray. In 1944 sixty-one cultures were grown and eight of them were found to be earlier than E.C. 593 by 6 to 13 days and also capable of yielding as much as E.C. 593. These eight have been retained for further study, rejecting the rest.

(c) *Sorghum*.—Thirty-seven of X-rayed derivatives selected in 1942 were grown in the summer of 1945. Twenty-five of them were from A.S. 809 and they did not germinate. The rest were from A.S. 2095. It was noted that none of the twelve selections were outstandingly earlier than the untreated control A.S. 2095, though the differences were statistically significant. However, thirty selections have been made for one more test for earliness.

51. *Pre-treatment of seeds with Growth substances*.—(a) *Cumbu*.—To verify the indications observed in 1943 that pre-soaking of seeds in dilute cow urine and other growth substances could increase the yield of P.T. 700 *cumbu*, an experiment was laid in 1944 summer. There were six treatments with six replications. Observations on plant height, earhead length, weight of grain and weight of straw were recorded. It was noted that plants of pretreated seed were distinctly taller, had longer ears and had also higher straw yields than those of untreated seed. In grain weight, however, the differences were not significant. In the monsoon season of 1944 another experiment was laid out with nine treatments with seven replications. A third experiment on the same lines was conducted in pots in that season. The data showed that presoaking in 10 per cent cow urine has on the whole better result than presoaking in other dilutions or in mere distilled water. It is proposed to repeat the experiments to confirm if presoaking in 10 per cent cow urine is superior to all other treatments.

(b) *Ragi*.—A similar experiment was conducted in the monsoon season of 1944. The results of this experiment showed that there was no appreciable difference in earliness as a result of the pretreatment. This is in contrast to the results observed in 1943, when the plants from *ragi* seeds soaked for 15 hours in one per cent cow urine flowered ten days earlier than the control. In grain weight all the four treatments where dilute cow urine had been used were better than the control, but plants from seed soaked in ten parts per million indolylactic acid gave a lower yield than the control. In straw values the pretreatments seem to have had the effect of reducing the yield as the control stands first in the ranking of the adjusted straw values. The same treatments will be tested once again in the next season.

COIMBATORE,
6th August 1945.

G. VIJAYARAGHAVAN;
Millet Specialist.

APPENDIX.

A short note on the main features of the work on millets done at the District Agricultural Research Stations in 1944-45 is given below :—

(a) *Sorghum*.—The season was adverse for sorghum at Anakapalle, therefore there was no progress. At Guntur also the early (*Punasa*) season sorghum failed on account of late season and the consequent *Calocoris* damage. The late (*Pyrus*) crop fared well. G.J. 103 gave a high yield of 1373 lb. per acre. Attempts to evolve further high yielders continued. Two selections Nos. 1558 and 1580 have been promising. At Nandyal in the three yield trials conducted for the third time for getting types suitable to the three different tracts, the selection N.J. 710 which has sweet and juicy stalk gave significantly higher yield than that of N.J. 29/68 the strain that is spreading. At Hagari the strain M. 47-3 is maintaining its superiority. Over 4,600 lb. of its seed was distributed. In order to build in it a high straw return some crosses have been in the sixth generation. One of them H.J. 471/2-3 was tested for yield and showed promise of superiority over M. 47-3. A scheme to evolve a high yielding strain of irrigated sorghum suited to the *hingari* season of the Tungabhadra Project area was started at Siruguppa. Previous experience was that sorghum grew well in the *mungari* but not in the *hingari*. Two hundred and two of the types available at Coimbatore were grown in the *hingari*. Most of the types had a very severe attack of the shoot-bug and sorghum fly and very few survived the damage. M. 47-3 was relatively better than the rest. A second crop in the following summer was raised to acclimatise some of the types. At Koilpatti the irrigated white sorghum strain K.S. 170 gave significantly higher yield than A.S. 2095 of Coimbatore that is spreading in the tract. The sorghum of Tenkasi is a distinct type for that tract. Other types are not a success there. Therefore on a small leased area improvement of the local sorghum has been in progress. The season was not favourable to report any result of note. One striking feature has been that M. 47-3 of Hagari set seed very well, and its bold pearly white seed on good sized ear attracted the attention of the cultivators.

(b) *Ragi*.—In the Vizagapatam district, ragi is grown in the three seasons. Trials were in progress at Anakapalle to evolve two types which will suit all the three seasons and for the North and South Vizagapatam. The results show that as yet there is no type yet superior to No. 525 for the early season. Selection No. 38 was a higher yielder than E.C. 593 to the extent of 31 per cent, and may be useful for the dry land sowings. For the late or *Pyrus* season, selection No. 207 is very promising as it has stood first in the two-year trials. In the irrigated area at Hagari the third-year trial of E.C. 593, E.C. 3517 of Coimbatore with

Hagari R. 42, showed that E.C. 593 is equal to R. 42 in grain return and superior to it in straw value, and that E.C. 3517 is unsuited for that area's main season. At Palur the work on ragi may be said to have led to outstanding result. Selection No. 382 has been the highest yielder in all the trials and is suitable to both *Kulla ragi* and *Perum ragi* seasons. It was the highest significant yielder in the five out of six district trials also. This strain can replace E.C. 3735 or the local *ragi* in that tract. At Koilpatti ragi was subjected to *Piricularia* and this gave an opportunity to study the relative resistance of the selections to the fungus. Those that have been comparatively less subjected to the disease have been selected for further study.

(c) *Italian millet*.—The Hagari strain No. 68 was noted to be relatively resistant to rust. In the yield tests at Hagari it was noted that the Nandyal strain 140 topped the list and the yield difference was significant.

ADMINISTRATION REPORT OF THE OILSEEDS SPECIALIST FOR THE YEAR 1944-45 (FASLI 1354).

Charge.—I was in charge of the Oil-seeds Section throughout the year under report. The Coconut Research Stations, Kasaragod, Pilicode, Nileshwar II and III and the Groundnut Research Station, Tindivanam, continued to be under my control.

2. *Staff.*—Sri G. Venkatanarayana continued as Superintendent in the Coconut Research Scheme during the year except for a period of two months from 6th April 1945 when he availed of two months' leave. Sri C. R. Seshadri continued as Superintendent, Groundnut Research Station, Tindivanam, till 31st March 1945 when he relinquished the post consequent on the termination of the Groundnut Scheme. He was posted as Superintendent, Coconut Research Station, Nileshwar, in the leave vacancy of Sri G. Venkatanarayana and later as Assistant Oil-seeds Specialist, Tindivanam, in the Groundnut Storage Scheme. He took charge of the post on 13th June 1945 reverting Sri M. Bhavani Shankar Rao to his substantive appointment as Assistant in Oil-seeds. Sri S. G. Ayyadurai officiated as Superintendent, Agricultural Research Station, Tindivanam, in the leave vacancy of Sri C. R. Seshadri from 15th September to 30th November 1944.

3. *Research Schemes.*—The undermentioned Schemes of Research run with financial aid from the Imperial Council of Agricultural Research continued to be worked in the Section:—

- (i) Scheme of Research on Coconuts.
- (ii) Scheme of Research on Groundnuts.
- (iii) Scheme for the Multiplication and Distribution of Improved Strains of Groundnuts.
- (iv) Scheme of Research on Pests and Diseases of Groundnut; and
- (v) Scheme of Research on Storage of Groundnuts.

Of these, the Scheme of Research on Groundnuts terminated on 31st March 1945 after having run for a little over eight years. Detailed reports of work done under these schemes are submitted separately.

4. *Season and rainfall.*—At Coimbatore, seasonal conditions were not altogether favourable for oil-seed crops due to uneven distribution of rainfall. Crops of castor, niger, safflower and mustard sown with July rains suffered greatly owing to the absence of subsequent rains in the months of August and September. Castor alone survived the drought and pulled up with the heavy rains in October and gave fairly good yields. The total rainfall during the year amounted to 32.62 inches as against 23.23 inches received during last year.

Seasonal conditions were very adverse at the Groundnut Research Station, Tindivanam. The total rainfall for the year

amounted to 46.16 inches as against the five-year average of 56.22 inches. The rains were very unevenly distributed. The south-west monsoon rains were received in time but proved erratic in distribution. The north-east monsoon started very late and continued at a stretch without any break almost right through October, November and early part of December, delaying harvest operations and spoiling the crop to a considerable extent. The hot weather rains were meagre and the severe summer conditions that prevailed affected the summer crops.

Rainfall at the Coconut Research Stations was below normal. The total rainfall at Kasaragod station amounted to 116.55 inches as against the past five-year average of 135.52 inches. Rainfall at Nileshwar totalled 117.09 inches as against a five-year average of 139.31 inches. The rains during south-west monsoon, north-east monsoon and hot weather period were all defective. The severe drought conditions that were experienced during the summer of 1945 increased the shedding of buttons (female flowers) in coconuts and are likely to adversely affect the yields.

5. *Groundnuts*—(i) *General.*—The area under groundnut in the Presidency which stood at 3,550,003 acres in 1943 was estimated at 3,911,900 acres in 1944, showing an increase of 10.2 per cent. The production was estimated at 1,769,200 tons of unshelled nuts as against 1,603,250 tons of last year registering an increase of 10.4 per cent. The groundnut crop in general suffered due to prolonged rains received towards the maturity period of the crop, which affected both the yields and quality of the produce. The demand for groundnuts, oil and cake continued to be keen. To conserve sufficient stock for use within the Province export control continued to be in force.

A total area of 61.21 acres was under Groundnut Research Station, Tindivanam, of which 40 acres were for seed multiplication of improved strains for distribution to the districts, the rest being under experiments. The season being very adverse for the groundnut crop, most of the field experiments did not give conclusive results.

(ii) *Improved strains.*—There was as in previous years, a keen demand for seeds of improved strains of groundnuts, viz., A.H. 25, A.H. 32 and A.H. 698, both from within and outside the Presidency. It is gratifying to note that strains A.H. 25 and A.H. 32 have done exceedingly well even in Baroda and Jhansi States from where there was a heavy demand for pure seeds of these strains. A total quantity of 44,500 lb. of seeds of improved strains was supplied from the Section during the year. About 280 acres of Primary Seed Farms were under improved strains in 28 taluks of Chittoor, Salem, North Arcot, South Arcot, Trichinopoly, Madura, Ramnad and Tinnevely districts.

(iii) *Experiments and research.*—Testing of single plant cultures isolated from varieties and progenies of crosses for yield and qualitative characters such as shelling outturn, size of kernels, oil

content, etc., continued to be important items of work. Besides these, cultural and manurial experiments and investigations on the control of pests and diseases of groundnuts and storage problems were pursued.

(a) *Yield trials*.—Thirty-three cultures with bunch habit of growth and early duration were compared with A.H. 32, the standard strain in final yield trials. Four cultures have again for a third season, given consistent increase in yield over the control.

Twenty-two cultures with spreading growth habit were compared with the ryots' variety of Local Mauritius and A.H. 25 the standard strain. Eleven cultures gave significant increase in yield over 'Local Mauritius', two of them giving better yields than A.H. 25. Out of these, one combines high yield with semi-spreading habit of growth and early maturity. These promising cultures are undergoing seed multiplication as a preliminary to district trials.

Eighteen bunch and ten spreading selections were under preliminary yield tests. Three cultures from the bunch and one from the spreading group gave significantly higher yields than the controls.

A total of 88 single plants selected from progenies of crosses for earliness, bunch habit, dormant seeds, etc., was under progeny row and family block trials. Eighteen of these cultures appear promising.

(b) *Trial of large-seeded types*.—To meet the demand for a large-seeded type of groundnut for edible purposes, nine varieties collected from different parts were compared for yields with Local Mauritius variety. *Arachis Rasteiro* and 'Texas' variety gave yields on a par with the control. These have seeds nearly double the size of the ordinary cultivated variety.

(c) *Hybridization*.—The F-1, F-2 and F-3 progenies of crosses were raised and studied for various morphological and economic characters. A total of 173 plants combining desirable characters of the parents, viz., bunch habit of growth, earliness, high yield, thin shell, etc., was selected for further work.

From the progenies of crosses, a plant with erect habit of growth has been isolated. As this is quite distinct in habit of growth from the existing types and also breeds true to type, this is being described as and given the status of a new botanical variety.

(d) *Manurial experiment*.—The manurial experiment started in 1943 was repeated for the third season with two levels of nitrogen, four levels of phosphoric acid, four levels and two sources of potash. The yield data on analysis did not show any significant differences between the different treatments. However, developmental studies conducted on a random sample of 50 plants in each treatment showed that flowering and growth were much better in plots which received 75 lb. of K-270 per acre over a basal dressing of 5 tons of cattle manure. Qualitative studies of the

produce obtained from different treatments did not show any marked difference in the quality of the produce such as, shelling outturn, size of kernels, oil content, etc.

(e) *Cultural experiment*.—The experiment conducted during the year for the third time with four different tillage treatments and two intercultivation practices did not show any significant differences in yield between plots receiving different tillage treatments. However, in regard to inter-cultivation practices, two rounds of hoeing and weeding gave better yields than one round of hoeing and weeding.

(f) *Control of pests of groundnut*.—Control measures against *surul* (*Stomopteryx nerteria*) were studied for a second time. Light-traps proved effective in attracting moths. The effective range of light-traps using ordinary hurricane lantern is about 50 yards. Spraying with groundnut oil or *Thevetia* oil emulsions did not reduce infestation to any appreciable extent. *Thevetia* oil emulsion when sprayed more than once depressed the yield of groundnut by 17 per cent. Varietal resistance studies conducted on 72 varieties did not show any variety to be resistant. Preliminary trials with D.D.T. at 5 per cent strength indicated reduction in *surul* attack and a high percentage of kill of the bug *Aphanus sordidus* which attacks freshly harvested pods.

(g) *Control of diseases of groundnut*.—Control of *tikka* (*Cercospora spp.*) leaf spot disease by the use of fungicides like Bordeaux mixture, colloidal copper, Bouisol and sulphur in different strengths was studied. All the fungicide in general reduced infection and increased the yields. Among the fungicides, Bordeaux mixture ($\frac{1}{2}$ per cent) appears to be the best in having given 52 per cent increase in yield over the control. Application of fungicides at two-week intervals appeared to be more effective than applying them at intervals of four weeks. The bunch variety responded more to the treatment than the spreading variety. The economics of spraying will be worked out after the experiment is repeated for the third time. No variety among the existing collection was found to resist *tikka*.

Varietal resistance to wilt (*Rhizoctonia bataticola*) and clump or bunched top disease of groundnut was studied in the case of 36 bunch and 36 spreading varieties including the wild species, viz., *Arachis Rasterio* and *Arachis Nambyquaraea*. In the bunch group minimum wilt infection was found in 'North Carolina Peanut' (1.3 per cent) while among spreading varieties 'Rufisque Senegal' recorded the lowest value of 5.3 per cent.

(h) *Deterioration of stored groundnut*.—The deterioration of groundnut kernels in storage in relation to the type of bedding materials used, the height to which bags are piled up, the proportion of wholes, splits and nooks in the sample, etc., was studied under actual godown conditions. Kernels of Coromandel variety at Cuddalore and Peanut at Masulipatam were stored in the port godowns and fortnightly samples drawn and studied for moisture, oil and

free fatty acid contents, refraction and insect incidence for a period of ten months. The important findings from the first year's experiments are:—

(1) Groundnut kernels which are not thoroughly dried develop acidity and damage fractions at a much faster rate than well-dried kernels.

(2) Caking up of the kernels in the bottom bags is more pronounced when bags are stored over a hard bedding material or hard floor and also when bags are piled up to a height of 10 bags and more.

(3) Decorticated groundnut containing only 25 per cent whole kernels show maximum increase in acidity, damaged fractions and insect damage when compared with material containing 50, 75 and 100 per cent wholes.

(4) Groundnuts stored as kernels show marked increase in acidity, damaged fraction and insect incidence as compared to groundnuts stored as pods.

(5) The most important insect pests of stored groundnuts met with in the three centres of storage, namely, Masulipatam, Cuddalore and Tindivanam are the caterpillars of the months *Ephestia cautella* and *Corcyra cephalonica* and the beetles *Tribolium*, *Necrobia* and *Oryzaephilus*. It was interesting to note that *Ephestia* and *Corcyra* were effectively controlled by a Braconid parasite which made its appearance at each of the centres every time the pest appeared.

(iv) *District trials*.—The improved strains of groundnuts were under yield trials and observation plots along with the local varieties in such of those districts where their suitability has not been properly tested previously. In Coimbatore district A.H. 25 gave an average increase in yield of 29 per cent over the local, while A.H. 698 gave only 20 per cent. In Penukonda taluk of Anantapur district, A.H. 698 has given an increase of 20 per cent over the local this year as against 27 per cent increase recorded last season. Results of trials conducted in Cuddapah district confirm that A.H. 25 is well suited to the tract.

6. *Gingelly*.—(i) *General*.—The area sown with gingelly in 1944-45 was estimated at 591,200 acres and shows a decrease of 15.4 per cent when compared with the finally recorded area of 696,838 acres for 1943-44. The total production of gingelly seeds for the Province for 1944-45 worked out to 73,200 tons which is short of last year's production by 9.9 per cent. Seasonal factors were mostly responsible for the reduction in area and yield.

An area of 21.31 acres was under experiments and seed multiplication at Tindivanam and Coimbatore.

(ii) *Improved strains*.—Seeds of S.I. 89, X-6 and X-38 were multiplied for distribution to the districts both at Tindivanam and Coimbatore. Due to adverse seasonal conditions the yields from seed multiplication plots were low and only 782 lb. of seeds could be distributed during the year.

(iii) *Experiments and research*.—Research work on gingelly was mostly directed towards the evolution of strains by cross breeding with a view to combine some of the important economic characters like short duration, high yield, high oil content, white seed and suitability for cropping during different seasons.

(a) *Yield trials*.—Sixteen cultures isolated from progenies of crosses and varieties were under yield trial during the cold weather and another four cultures during the summer season. The adverse seasonal conditions that prevailed affected the general stand and yield. In the cold weather trial, six cultures though giving increased yields were only on a par with the local. In the summer trials none of the cultures outyielded S.I. 89.

One hundred and sixty-two cultures from progenies of crosses and varieties were under row tests during cold and 75 cultures during the summer season. A total of 118 cultures has been earmarked for further trial.

(b) *Phyllody or 'Green leaf' disease*.—In the varietal resistance studies none proved entirely resistant to phyllody. Varieties 'Entebbe Uganda' and Malan (Burma) are found to be least susceptible in having recorded only 0.9 and 1.9 per cent of infection respectively. Variety 'Jessore' gave the highest infection of 78.4 per cent. 'Entebbe Uganda' and 'Malan' are proposed to be used as parents in crosses for evolving an economic strain better resistant to phyllody than existing ones.

(iv) *District trials*.—The season for gingelly having proved adverse almost throughout the Presidency, most of the district trials proved a failure. However, in Tanjore district strain X-38 evolved from a cross between a South Arcot variety and Malabar wild gingelly gave better yield than local variety and appears suitable for summer cropping. Strain X-6 appears to be suitable for early sowing in Nellore and portions of Visakhapatnam.

7. *Castor*.—(i) *General*.—The area under castor in the Province in 1944-45 was estimated at 262,700 acres showing a decline of 6 per cent over the finally recorded area of 279,032 acres for 1943-44. The yield for 1944-45 was estimated at 24,200 tons as against 24,640 tons for the previous year.

A total area of about 10 acres was under experimental cropping during the year.

(ii) *Improved strains*.—Seeds of improved strains of castor, viz., R.C. 215, R.C. 59-2-1-1 and R.C. No. 59-8-1 were multiplied both at Tindivanam and Coimbatore for supply to the districts. These strains are becoming popular with the ryots of this Presidency. Strain R.C. 215 has also been reported to be suited to Bengal conditions from where there was a demand for 800 maunds of seeds. As the season proved adverse, the yield from seed multiplication plots was low and therefore only 1,200 lb. of seeds could be distributed during the year.

(iii) *Experiments and research*.—Research work on castor is being mainly directed towards the evolution of early maturing types combining high yield, high oil content and non-shattering nature of seeds, etc., by cross breeding.

(a) *Yield trials*.—A fresh batch of castor strains evolved under the All-India Castor Improvement Scheme at Hyderabad (Deccan) was compared with the local strains. The Hyderabad strains were longer in duration and gave lower yields than the control.

Among the three new cultures isolated from progenies of crosses and compared with the standard strain for yield, one culture has given 30 per cent increase over the control.

Twenty selections from varieties and progenies of crosses were under preliminary yield trials. Out of these, 18 appear promising.

(b) *Purity studies*.—Castor being a highly cross fertilized crop, purity studies of selected cultures were continued. A total of 102 cultures was studied and selfed for obtaining pure seeds.

(c) *Inbred types*.—To afford material for breeding work, inbred types are being maintained from year to year. One hundred and forty-seven types were grown and studied for various characters. Type plants were selfed and necessary seed material gathered for maintaining pure lines.

(d) *Hybridization*.—The F-1, F-2 and F-3 progenies of crosses made for combining earliness, high yield and non-shattering nature of seeds were studied in detail. A total of 159 single plants having desirable combinations of characters was selected for further work.

(e) *Deterioration of stored castor seed*.—Seeds of R.C. 59-2-1-1 castor were stored in gunny under ordinary laboratory conditions and studied every month for moisture, oil and free fatty acids. The study has been in progress for the past one year and no appreciable increase in acidity or decrease in oil content has taken place. There was also no damage due to insect attack.

(iv) *District trials*.—The three castor strains R.C. No. 215, R.C. 59-2-1-1 and R.C. 59-8-1 were again tried in Anantapur and Salem districts for the second year. The season was adverse for castor throughout the two districts and the trials completely failed at 5 out of 16 centres where the trials were laid out. Strain R.C. 59-2-1-1 and 59-8-1 proved better than the locals in almost all centres while R.C. 215 did not fare well as a rainfed crop. In both Salem and Anantapur districts R.C. 59-8-1 and 59-2-1-1 have given outstanding increase (over 50 per cent) in yield over the locals. The trials are being repeated for another season to fix up the strain most suited to the tract.

Reports about the performance of the strains from some of the other districts are also encouraging. In Bellary district strain R.C. No. 59-2-1-1 has recorded increased yield over local in all the

ten observation plots, the percentage increase varying from 6 to 20, the average being 12 per cent. In Cuddapah district the strain has recorded 50 per cent increase at one centre.

8. *Coconuts*—(i) *General*.—The area under coconuts in Madras is estimated a little over six lakhs of acres. There is a marked tendency for the area to increase.

(ii) *Improved planting material*.—The demand for selected pedigree seednuts and seedlings continued to be keen from all over the Province. During the year, 7,396 seednuts and 4,055 selected seedlings were distributed to growers. A coconut nursery scheme to supply about 8,000 selected seedlings every year has been sanctioned by the Government for a period of four years and has been started at Nileshtar station. The first batch of seedlings will be available for distribution in 1946.

(iii) *Experiments and research*.—(a) *Manurial experiment*.—Manurial experiment on coconut with graded doses of ammonium sulphate, viz., $1\frac{1}{2}$, 3 and $4\frac{1}{2}$ lb. per tree per year was continued. The application of $4\frac{1}{2}$ lb. of ammonium sulphate has given significant increase in yield over the other treatments.

Experiments to determine the best manure for sandy soil and the effect of using groundnut cake in place of ammonium sulphate were in progress. The yield data do not show any significant differences in yield due to the treatments. The effect of manures on the yield of coconuts is generally felt only after about three years since the beginning of the treatment.

The indigenous weed *Crotalaria striata* is found to come up well under the shade of coconuts in sandy, loamy and gravelly soils and appears suitable for growing as a green manure crop in West Coast coconut gardens.

(b) *Cultural experiment*.—The experiment to study the effect of different systems of cultivation, viz., digging with mamatty and ploughing with iron plough in different seasons was continued during the year. Digging the garden once with mamatty (August–September) appears to increase the yield more than ploughing twice.

(c) *Button shedding*.—Selected trees of different yield groups of the ordinary West Coast variety and world varieties were observed for shedding of 'buttons' or female flowers from the date of their opening. Shedding was again found to be maximum during the third and fourth weeks. An examination of shed buttons showed that about 30 per cent of them were not fertilized. Maximum shedding occurred during the rainy months (June to August) and least during the cold season (December to February).

(d) *Varietal studies*.—All the fourteen different varieties of coconuts were studied for the rate of production of leaves, female flowers, yield of nuts and copra, setting percentage, etc. Cochin

China, Andaman Dwarf, Java, Laccadives and Gangabondam exhibit many desirable characters.

(e) *Hybridization*.—To find out the best combination of parents that would induce maximum hybrid vigour in their progenies a number of intra and inter-varietal crosses were effected during the year. In all, 53 inflorescences were cross-pollinated and 952 crossed nuts obtained.

The hybrid palms of Tall × Dwarf cross continued to give satisfactory yields.

The seedlings obtained by 'self', 'natural' and 'cross' (controlled) pollination from trees belonging to six different yield groups and planted out in 1942 for a comparative study were regularly observed for the various measurable characters relating to growth. The data so far collected on the more important leaf characters show that progenies obtained by self-pollination and from trees yielding 40 or below 40 nuts per year are less vigorous than those obtained by natural or cross-pollination or from trees of higher yielding capacity.

(f) *Retting trials*.—The outturn of fibre from 9, 10, 11 and 12 months old husks retted for periods of six, nine and 12 months was studied. Twelve and 11 months old husks yielded significantly more fibre than nine months old husks. A retting period of six months was found hardly sufficient for satisfactory retting under West Coast conditions. The fibre from 10 and 11 months old husks retted for nine months gave the best coloured (golden yellow) fibre.

(g) *Miscellaneous trials*—(i) *Crossing thick-meated parent with thin-meated parent and vice versa*. To assess the influence of the male parent on the endosperm (kernel) of the resulting nut, a number of crosses were done between thick-meated and thin-meated parents. An examination of the thickness of kernels of the resulting nuts showed that thickness of the kernel was reduced when a thick-meated female parent was crossed with a thin-meated male parent.

(ii) *Infection trials*.—Infecting the female flowers at the time of stigmatic receptivity with material collected from freshly shed buttons and barren nuts did not increase the shedding of buttons or percentage of barren nuts.

9. *Cashewnuts*.—The manurial experiment on cashewnuts started in 1942 was continued. Significant results have not been obtained so far.

10. *Oil palms (Elacis quineensis)*.—Oil palms growing at the Coconut Research Stations were regularly observed for their various morphological characters, yield, etc.

11. *Minor oil seeds*.—Varieties of niger, safflower and mustard were sown at Coimbatore for comparative study. The season again proved very adverse resulting in the failure of these crops.

12. *Qualitative analyses*.—The following samples of oil-seeds were analysed during the year for their moisture, oil and free fatty acid contents in connexion with the various experiments:—

Groundnuts	..	..	..	..	10,180
Castor	..	..	..	..	33
Copra	..	..	..	..	1
Total ..					10,214

Estimations of the percentage of kernels to pods, number of kernels per pound and weight to volume relationship of pods and kernels were made on all groundnut cultures under yield trials.

13. *Miscellaneous*—(i) *Enquiries*.—Large number of enquiries connected with the cultivation and other aspects of oil-seed crops were received and replied to.

(ii) *Training*.—The Military officers who underwent training in Agriculture were given instructions on oil-seeds cropping.

(iii) *Exhibition*.—Suitable exhibits of oil-seeds were sent to almost all the important exhibitions held in various parts of the Province.

(iv) *Committees and meetings*.—I attended all the meetings of the Research Council and served on the Annual Reports Scrutiny Committee. I was nominated as a member of the Oil-seeds Committee of the Imperial Council of Agricultural Research.

14. *Seed distribution*.—There was increased demand for seeds of improved strains of oil-seeds. The following are the quantities supplied during the year.

Groundnut	.	..	..	..	44,500 lb.
Gingelly	..	..	..	..	782 „
Castor	..	..	..	..	1,200 „
Cashewnut	..	..	..	..	406 „
Coconut seed-nuts	..	..	..	..	7,396 numbers.
Coconut seedlings	..	..	..	..	4,055 „
Oil palm seeds	..	..	..	..	12 „

15. *Audit*.—The annual audit of the accounts of the Coconut Research Stations, Kasaragod, Pilicode, Nileshwar II and III and the Groundnut Research Station, Tindivanam, was conducted by me during the year.

AGRICULTURAL COLLEGE AND RESEARCH
INSTITUTE LAWLEY ROAD, P.O.,
COIMBATORE,
20th August 1945.

C. M. JOHN,
Oilseeds Specialist.

ADMINISTRATION REPORT OF THE PULSES SECTION FOR THE YEAR 1944-45.

Charge.—I was in charge of the Pulses section throughout the year. The Regional Stations at Vijayanagaram and Salem were managed by my first and second assistants Sri M. P. Narasimha Rao and Sri V. Srinivasan respectively. At the main station, assistant Sri B. Suryanarayanamurthi helped me in the work.

2. *Tours.*—I was on tour for 114 days for the inspection of the sub-stations and in connexion with purchase of good pulses seeds for distribution to the different District Officers. The assistants were on tour for 173 days. They were engaged in survey and collection of pulses in the concerned districts.

3. *Main station—Coimbatore.*—The lands taken on lease during last year had to be given up. The work has been carried on in about 30 acres of suitable land from Central Farm, Coimbatore, which was so kindly placed at my disposal by the Superintendent, Central Farm. The south-west monsoon started very late and at the lag end of the season heavy showers were received. The different varietal samples collected in redgram, blackgram, greengram, cowpea and lablab from all over the Province were quickly sown in randomized replicated plots. Forty-nine samples in redgram, 100 in greengram, 49 in blackgram, 36 in cowpea and 25 in lablab were sown for selection work in replication plots under Lattice design of lay-out under rainfed conditions. In addition to these, 11 greengram and 12 blackgram samples were grown in replicated plots at Coimbatore and Tirurkuppam Paddy Breeding Stations after paddy harvest. Based on growth, vigour, earliness, grain colour and size, etc., 140 in redgram, 190 in blackgram, 290 in greengram, 190 in cowpea and 30 in lablab single plants have been selected.

From the redgram materials transferred from Cotton section, 22 promising strains were put under four sets of comparative trials with 1723 strain as standard. None of these strains were significantly better than strain 1723. Six strains in redgram, namely, 1723, 2900, 2745, 2515, 1969/2, 2424/1 and 3009 were multiplied for seed for spread in the districts. The results of the trial plots conducted with these strains in the Research Stations at Hagari, Nandyal and Guntur were analysed. Strains 2900, 1723 and 3009 proved very promising in Hagari and Nandyal. The trials are being continued in other stations also.

Horsegram.—One hundred and forty-three single plants selected last year were put in a randomized replicated trial with D.B. 7 as control. Eighteen promising selections are selected for further trial. Strain D.B. 7 is multiplied for seed.

Bengalgram.—One hundred and twenty single plants were sown in randomized replicated trial with strain 468 as control. The crop

failed due to heavy downpour of rain during the initials stages. The few surviving plants were retained for retrial. Strains 468, 482 and 2965 have been multiplied for seed for further spread.

Cowpea.—Three strains in cowpea, C. 521 for grain, C. 422 for green manure and C. 419 as green vegetable were multiplied and 30 cowpea types were raised for detail study.

Lablab.—Two strains in lablab, one as a rainfed vegetable and the other for grain (D.L. 1128 and D.L. 231) respectively were raised for seed and 29 types were also grown for detailed study. In addition to these 30 varieties in Kitchen garden lablab and 20 in cluster beans were also raised for seed.

Sub-station at Vijayanagaram.—In redgram 25 varietal samples (including 1723, 2900 and local variety) were sown in four replications under Lattice design of layout and 248 single plants have been provisionally selected. In blackgram 25 district samples were sown in four replications in randomized blocks and 229 single plants were provisionally selected. The same samples were tried in the cold weather season under irrigation to study their performance under different conditions. In greengram 36 district samples including 9 from dry land zone, 16 from wet land tracts and 11 types got from Agricultural Research Station, Samalkot, were sown in four replications in randomized plots during the early season. Eight samples from the above bulks were again raised in the cold weather season under irrigation to study the performance under different conditions. Three hundred and forty-three single plants were provisionally selected from the groups for further trial. In horsegram 99 single plants selected from last year's material were put under randomized trials in four replications with D.B. 7 and local variety as standards. The results have been analysed and six types proved significantly superior to local. Another nine more desirable types will also be carried forward for inclusion for the next season's trials.

Sub-station at Salem.—Twenty-three samples of redgram collected in Salem and in North Arcot and other districts along with the strains 1723 and 2900 were sown under Lattice design of layout. Based on growth, vigour, earliness and freedom from disease, 119 single plants were selected for further trial. In lablab 23 district samples collected along with the strain D.L. 231 and D.L. 173 were put under randomized blocks in four replications. Ninety-eight desirable single plants were selected from all over the replications for further trial. In horsegram the 194 single plants selected during the last season were sown in four replications as per Lattice design of layout with local variety and strain D.B. 7 as controls. The yields of these progenies were analysed and 13 types proved significantly superior over the local bulk. Along with these seven more desirable types will be carried forward for trials next year.

Seed multiplication.—Redgram strain 2900, horsegram strain D.B. 7 and lablab strain D.L. 231 were multiplied and 678 lb., 792 lb. and 330 lb. of seeds respectively were obtained for distribution.

Pulses purchasing scheme.—In order to stimulate fresh areas under pulses, a scheme was put for purchase and distribution of seeds. Rs. 1,90,000 was sanctioned for the scheme. So far 831 bags of blackgram, 281 bags of greengram and 1,856 bags of redgram seeds have been purchased and supplied to the District Officers for free distribution to ryots so as to bring new areas under pulses. The balance of amount has been set apart for purchase and distribution of wet land blackgram.

COIMBATORE,
10th August 1945.

SAMUEL JOBETHA RAJ,
Pulses Specialist.

ADMINISTRATION REPORT OF THE FRUIT SPECIALIST, KODUR, CUDDAPAH DISTRICT, FOR THE YEAR 1944-45 (FASLI 1354).

This forms the fourth administration report of the Fruit Section.

2. *Charge.*—I continued to be in charge of the section throughout the year under report.

3. *Staff.*—A scheme for extended work on hill fruits was sanctioned in G.O. Ms. No. 2554, Development, dated 26th May 1944, but the work under the scheme could not be started as the staff are yet to be posted.

At the Fruit Research Station, Kodur, the post of second Assistant was vacant for 41½ days owing to the grant of earned leave to Sri P. V. Suryaprakasa Rao for 15 days and his deputation to Iyallpur for training on fruit products. Similarly, the post of the Storekeeper at the Government Nursery, Kodur, remained vacant for 74 days consequent to the posting of Sri M. Satyanarayana by transfer as Fieldman at the Fruit Research Station, Kodur.

At the Pomological Station, Coonoor, Sri N. Mathan resigned the post of Storekeeper on 1st November 1944. The post was filled up on 31st November 1944 by Sri S. Venkatraman, whose probation was terminated on 23rd April 1945. The post has since remained vacant for want of a suitable candidate. The post of Fieldman on the same station remained also vacant for a total number of 233 days in the year for a similar reason.

At the Fruit Station, Kallar, also unavailability of suitable candidates rendered it necessary to keep the post of Fieldman vacant for 31 days in the year.

Consequent to the transfer of Sri R. Shanmukhasundaram, Assistant, Banana Fibre Scheme, Coimbatore, for district work, Sri K. Mahabala Shetty relieved him on 28th June 1945. The former was also on earned leave without a substitute for 30 days in November 1944.

Sri S. R. Gangolly, Assistant at Kodur, was also on earned leave for 13 days in January 1945. The posts of first clerk and typist remained vacant for a total number of 69 and 21 days respectively, partly due to the transfer of the former in May 1945 and partly due to the unavailability of suitable candidates to fill up the vacancies. It is to be expected that the repeated changes in staff and the prolonged vacancies in several cases will materially dislocate the work of the section, causing incidentally considerable additional strain to the meagre remaining staff.

4. *Tours.*—I remained out on tour for a total number of 89 days, during which I inspected all the outside stations and schemes under my control and the College Orchards at Coimbatore thrice each as well as the Fruit Centre at Anakanalle once. All the Fruit Sta-

5. The work done during the year is reported under the following five heads—

I. Advisory, II. Teaching, III. Research, IV. Horticultural and V. Miscellaneous.

I. ADVISORY.

Enquiries.—As many as 135 enquiries on numerous aspects of fruit production and nursery practices were received and attended to. This excludes the enquiries received from the public on the availability of supplies of plants and plant material, averaging to 29 enquiries per month.

2. *Inspection of private orchards.*—In all, 34 private orchards and one fruit nursery were inspected for rendering advice to the owners.

II. TEACHING.

1. *Degree Course.*—Four special lectures were delivered to the students of the Agricultural College, Coimbatore, on fruits and vegetables.

2. *Post-Graduate Course.*—Sri K. S. Venkatramani continued to work on certain vegetables and culinary bananas till December 1944 at Coimbatore under my guidance. His thesis was accepted by the Madras University and he was declared qualified for the degree of M.Sc.

3. *Non-stipendiary students.*—Five students received training in fruit nursery practices at Kodur for periods ranging from 5 to 95 days. Of these, one was deputed from Cochin State for two months and another from Coorg for 3 months.

III. RESEARCH.

The research work carried out during the year is reported below under the concerned heads or stations.

1. *Fruit Research Station, Kodur.*—A total rainfall of 42.43 inches was recorded on 78 rainy days. At the end of the year the highest proportion of healthy trees in the sathgudi orange rootstock trial area was found on rough lemon and gajanimma, and the lowest on kichili, billikichili and chinee rootstocks as well as among the unworked scion seedlings. At the end of 77 months of planting, acid lime rootstock has produced the largest sathgudi trees in this area. Early and good bearing tendencies continue to be the feature in sathgudis budded on woodapple. In the acid lime rootstock trial area the budded trees have produced significantly greater tree spread and higher yields than the seedlings, the trees on gajanimma continuing to top the treatments with $2\frac{1}{2}$ times the yield up-to-date of those on the seedlings. Three varieties of sweet orange and one of grape fruit have been adjudged as the most promising among the citrus variety collections, as based on the year's performances. Among the citrus seedlings, limes, lemons

and citrons have proved to be the most precocious. Pruning acid lime trees for shape has been found to depress the yields in the third year of the treatment.

Double-grafts of Neelum have yielded a larger crop in the year under report than Neelum and Bangalora trees raised by inarching and root-grafting. Superior tree size and tree vigour continue to be associated with Neelum and Baneshan trees inarched on polyembryonic rootstocks than on the monoembryonic. Among the former both Neelum and Baneshan trees have recorded the highest average tree yields on Goa rootstock. The double-worked trees of Himayuddin, Jehangir and Allumpur Baneshan continue to exhibit precocious and higher crop yielding tendencies than the single-worked trees of the same varieties. Of the 569 mango flowers hand-pollinated with different parental combinations, only four fruits matured by the close of the year under report. Four mango varieties characterised by regular bearing tendencies and seven trees showing heavy yielding propensities have been isolated for multiplication from the variety collection area. Two mango seedling progenies, viz., KO. 7 and KO. 16 have cropped for the first time yielding fruits of such exquisite qualities as to form valuable additions to the existing mango wealth.

In the vineyard, Lukfata has once again shown to be resistant to downy mildew, while White and Red Muscadel varieties similarly continue to be resistant to powdery mildew. Four varieties of pomegranates, two of guavas and four of sapota have performed well in the year denoting their promising behaviour under Kodur conditions. Among the other fruits, custard apple, cashew, phalsa and Kegjambrool roseapple have yielded good crops.

Success was met with in the yema-grafting of Bedana grape on the rooted cuttings of Red Mascatel and in the side-grafting of sapota on *Bassia latifolia* and *Mimusops hexandra*. Artificial pollination of normally non-maturing fig syconiums with the pollen of *Ficus glomerata* was pursued during the year also with success.

2. *Pomological Station, Coonoor.*—A total rainfall of 64.10 inches was recorded on 128 rainy days during the year under report.

Among the standard clonal stocks for apple, the Mallings failed to respond well either to layering or to mounding, possibly due to their high susceptibility to woolly aphis. The crabs suckered well both by layering and mounding but showed slight infestation of the aphis, while the Mertons responded well both to layering and mounding, besides remaining entirely free of the woolly aphis. The results of apple bench-grafting trials in the year confirmed in general those deduced in the previous year. It is now established that Rome Beauty, Winterstein and Irish Peach lend themselves for bench-grafting, particularly in November. The pruning trials with Winterstein apple which were in progress have also confirmed in general the previous years' inferences to the effect that annual tipping of leader and lateral shoots promotes better flush and higher

blossom production than on unpruned trees. Blossom and fruit thinning on Irish Peach apple trees has been found in the year to be an uneconomic practice.

For the budding of plums, the shield without wood method has been indicated in the year as superior to the flute method. Combination and Hale varieties of plum top-worked on *Prunus aivaricata* seedling rootstocks have put forth more satisfactory growth than Rubio and Alu Bokhara plums on the same stock. Fruit thinning trials on Rubio plum as carried out in the year have yielded results confirming the findings of the previous two years, viz., that such thinning increases fruit size and reduces the extent of natural shedding appreciably.

In pears, propagation by cuttings has failed to give any success with Kieffer and China pear varieties while with stock pear the success was fairly high, which fact brings out one more important difference between this and the Kieffer as against the popular belief that these two varieties are synonymous. Stock pear has, however, failed to sucker in layering beds. On this stock a high "take" exceeding 80 per cent was secured by whip and tongue grafting of choice pears, as compared with a fairly low "take" of about 46 per cent with shield without wood budding with the same scion varieties.

Shield without wood budding has recorded a cent per cent "take" with Killikrankie peach when the buds were inserted in December, whereas not a single flute bud in that month succeeded. Whip and tongue grafting also failed to give a high success with the same variety. The superiority of shield budding with the above scion variety seems therefore clearly established.

Rooting of persimmon cuttings does not appear to be feasible at Coonoor, as no cutting succeeded from the three batches planted from October to December. Pruning of Dai Dai Maru variety has failed to lead to better performance than the unpruned trees during the year. Curing of persimmons by keeping the fruits in association with Kieffer pears in an air-tight chamber for two or three days, was tried on an extensive scale in the year with complete success. The method can now be safely recommended to the public.

Passion fruit has borne a very good crop at Coonoor during the year under report. As a source of an exceptionally high flavoured fresh fruit squash, this fruit is entitled for much greater popularity than it enjoys at present.

Strawberry splits have been found on transplantation to give a 95 per cent successful stand as against a 65 per cent successful stand with runners. New growth from the former was also markedly more vigorous than from the latter, while the first flowering was also earlier by about 60 days in the former case.

3. *Fruit Station, Kallar.*—The rainfall recorded during the year was 50.32 inches on 114 rainy days.

The high casualties in mangosteen side-grafts during the summer months denote the need to either pre-harden the same before planting or to plant them under dense natural shade. As high as 90 per cent "take" was secured by side-grafting mangosteen in August 1944 *in situ* on young seedlings of about three years of age, while in November the "take" was only 43.5 per cent and in July only 10 per cent. The seasonal influence on the "take" is, therefore, obvious and this is borne out from the trials in the previous years also. Side-grafting on other allied stocks was less encouraging the "take" being nil on *G. tinctoria* and *G. cambogia* and 12.5 to 17.0 per cent on *Calophyllum inophyllum* in October and November insertions respectively. Trials on the sowing of mangosteen seeds in the year tend to confirm the last year's inferences, since the seeds sown in October 1944 in peaty soil have germinated earlier and far better than in sandy loam. As against the popular belief that gamboged seeds do not germinate, a 50 per cent germination was recorded in such seeds. Sowing of healthy seeds with pulp has, on the other hand, found to be an undesirable practice as only 17 per cent of such seeds germinated during the year.

Observations on the transplanting of seedling rootstocks for mangosteen have confirmed the previous year's inference that *G. tinctoria* is the most difficult to transplant at the buddable stage, but the same can easily be done without any loss when about three months of age.

A high success was obtained during the year in the layering of avocado, litchi, rose apple, cacao and *Derris elliptica* as well as in the inarching of soursop and custard apple on bull's heart and sapota on *Bassia latifolia*, while a fair amount of success was met with in the inarching of star on rose apple and *vice versa*.

In all, 1,585 plants were supplied from the station nurseries during the year under report.

4. *Fruit Station, Burliar.*—A total rainfall of 70.10 inches was recorded on 115 rainy days.

The cherimoyer graft on bull's heart continues to show early and high bearing tendencies, it having produced two sizable crops within the eighth year of planting, while the seedling trees were yet in a pre-bearing state in the twelfth year of their planting.

Budding and side-grafting of mangosteen on *G. tinctoria* failed to give any success, while inarching produced a successful "take" of 16.5 per cent only. A fairly high success was also obtained by inarching jak on jak seedlings. Budding with durian and jack proved a failure, but inarching of the latter on the same stock produced a fairly high "take" of about 55 per cent. Similarly, with cherimoyer a 50 per cent "take" was secured by inarching on bull's heart seedlings, though budding on the same stock was of no avail.

The number of plants sold or transferred came to 1,642 in the year.

5. *College Orchards, Coimbatore.*—Inadequacy of irrigation water, unsuitable soils and meagre staff continue to be the serious handicaps at this centre. A separate mango area was established by the planting of trees of 24 varieties representing the choicest in cultivation in the Province, in order to provide material for teaching the students of the Agricultural College. Among the older trees of mangoes, Baneshan has been found to be the most consistent cropper, though Amini has given the highest average yield in the last four years. Bangalora and Peter failed to crop in two of the four years, while Mulgoa has been yielding consistently poor crops. Observations on nine so-called varieties of papayas has established that none of them breed true to the parents by seed. In the banana area, varietal performances have indicated that Myndoli is the best yielder with 57 lb. of fruit, Kotha Bontha is the longest duration variety (20 months and 20 days) and Vamanakeli is the shortest (9 months 27 days), Namarai is the poorest yielder with an average of one pound only per plant, and Rasthali, Neypoovan, Kapur, Kal Eththan, Poovan, Kali, Patcha Nadan, Karim Kadali and Mal Bhog are the relatively resistant varieties to high winds. A total number of 942 suckers was distributed in the year.

6. *Fruit Centre, Agricultural Research Station, Anakapalle.*—A net profit of about Rs. 756 per acre from the plant crop and of about 847 per acre from the ratoon crop of a mixed banana plantation with 25 and 19 varieties respectively, reveals that in bananas we have quite a remunerative crop. In regard to other fruits on the station, there are no special features to report upon. However, 554 plants of different fruits were sold during the year.

7. *Fruit Centre, Agricultural Research Station, Lam (Guntur).*—Vadlapudi trees failed to bloom in winter for the main season crop, as a result of which there was no summer crop in the year. Sathgudi trees on Gajanamma have yielded higher crop on this station also than on Kichili and Jamberi by the sixth year of planting, but the fruits of the first treatment were pithy with thick skin. Greatest damage by fruit sucking moth was experienced in the year on loose jacket oranges, and by mangooppers on Himayuddin and Jehangir varieties. Of the 17 varieties in the mango collections, Suvarnarekha has produced consistently fair sized crops during the past three years and this is followed by Rumani, Kolankagoa, Panakalu and Cherukurasam. Kothapalli Kobbari and Langra are the only two varieties which have not fruited yet. The off-season variety has flowered in June in 1945 also, along with two Neelum trees. Among the guavas, the seedless variety is found to be a shy bearer. Pomegranates, figs and grapes have given disappointing performances.

8. *Fruit Centre, Agricultural Research Station, Taliparamba.*—As the post of Fruit Assistant at this centre remained vacant for about 5½ months till 16th December 1944, the work on fruits has had a set-back.

From the mango inarching trials with five scion varieties from February to April and with two varieties in June 1944, it has become clear that a very high "take" can be secured even when the operation is done in the hot and dry months of the year, as well as at the commencement of the south-west monsoon, provided care is bestowed on the watering of the seedling rootstocks in the former period.

Insertion of mango scion shoots on trees headed back to a height of three feet from the ground level has produced high and better success than the insertion on trees of which the branches were lopped to the main trunk. The promising early and late varieties of mangoes on the station have been selected and marked out. Mulgoa was the most affected variety by the fruit fly maggots, the damage having amounted to over 50 per cent of the crop in the year.

Cuttings of *Mimusops hexandra* rooted easily on the station during the rainy season. On the whole, sapotas appear to thrive well on the station. Observations seem to show that Navaneethan and Baramasi varieties as grown here are synonymous.

From the trials on the sowing of seeds of *Garcinia indica*, it is inferred that fresh seeds sown without the seed coat germinate in 9 days, same seeds with the seed coat germinate in 15 days and seeds allowed to dry and sown with the seed coat germinate in 30 days. Heavy fruit shedding in mangosteen resulted due to drought from February to April and heavy rains at the time of flowering. Ripening of mangosteens occurred in 85 days during the hot season as against 105 days during the rainy season. In the latter case, the fruits got badly affected by gamboge and got mostly cracked. It appears that the trees should be induced to mature their crop before the rains, if mangosteen cultivation is to become popular in the West Coast.

From the preliminary trials on the sowing of cashewnut seeds, it would appear that sowing the nuts with the suture slanting and facing upwards and at a depth of two inches below the ground is the most desirable practice. Yield from cashewnuts averaged to 2.25 lb. only in the year while the average yield from 10 selected trees was as high as 32 lb. per tree.

Among the bananas in the station collections consisting of 10 varieties, Mauritius has proved to be the shortest duration variety followed by Nendran, Ponnani and Kuduravali, while Kaio was the longest duration variety with Chakkarakeli slightly earlier than Kaio.

The total number of plants and suckers sold in the year was 3,678.

9. *Fruit descriptions.*—A correct nomenclature and classification of fruits being a pre-requisite of any plan for the fostering of commercial fruit farming on economic lines, work on detailed description of fruits under cultivation in the Province has been in progress ever since the section was organized. The descriptions

of all the cultivated mango varieties of the Province, which had been previously recorded were carefully analysed and a simple key for running down every variety to its natural status and for its identification at all stages of its growth or performance, was prepared. This voluminous work which has taken nearly six years of time is nearing completion, and a detailed monograph with about 400 sketches and diagrams is almost ready for publication and for use as a standard work for reference.

Morphological descriptions of 37 individual mango hybrid progenies were completed along with those of 16 mango seedlings that arose by chance pollination in nature. The latter have all reached the bearing stage. From their fruit descriptions, it is found that three progenies, viz., K.O. 7, K.O. 16 and K.O. 11 have produced high quality fruits, such that the first two constitute valuable additions to our mango wealth, while the last one can also be classed as equal to many of the existing superior table varieties in cultivation.

Among the mango introductions from abroad, Karutha Kolamban, Vellai Kolamban and Ambalavi have been found at Kodur to yield fruits very sweet to taste and, therefore, possessing a great deal of appeal to the prospective mango growers.

From the study of tree and leaf characters of 133 *citrus* seedling progenies at Kodur, it has become possible to correctly diagnose five progenies which had been collected under wrong names. In addition, the study has disclosed that lime Sadaphal is a non-mamillate lemon being synonymous with Doodanimma, and orange China Hazara is synonymous with the kumquat.

A survey of 21 ziziphus orchards conducted in Kurnool, Anantapur and Cuddapah districts has helped to select two progenies for fruit quality and four for high degree of resistance of fruit fly attack. The fruits of all these selections have been described and recorded.

As a result of the morphological study of litchis from the Burliar Fruit Station, tree No. 8 has been selected as the best for quality. The tree which was grown under the name of star-apple at Kallar has now been identified to be the real Malaya rose-apple—*Eugenia malaccensis*, L.

IV. HORTICULTURAL.

Banana Fibre Scheme.—From the trials on the hand extraction of fibre from 1,140 pseudo-stems of 70 different varieties during the year, it is observed that Pey Ladan, Myndoli, Elavazhai and Kalluvazhai yield the maximum mean fibre weight per stem, while Mauritius and Namarai yield the least. *Musa textilis* and Moongil are, however, the easiest for extraction of fibre, while Namarai and Kadali are the quickest to be extracted. The fibre tests have shown that Kalluvazhai, Kaio, Buditha Montha Bathees and Elavazhai possess the finest fibre, while the tensile strength is the greatest in Kuri Bontha, Nalla Bontha, Nana Nendran, Thella Bontha. Karim Kadali, Adaka Kunnan, Chenkadali Vannan and Mayilvazhai. The trials have also indicated that the pseudo-stems after the

harvest of fruit provide the most feasible and economic material for fibre extration. *Musa textilis* seeds failed to germinate, presumably due to the non-development of the endosperm. The fibre extracting machine devised by the Industries department has not proved superior to the hand-extracting method, it being particularly more expensive and unsuitable for certain varieties. The preliminary trials show that banana fibre is suited for rope and gunny making and also for use as bandaging materials for grafts and budded plants.

2. **Fruit Nursery, Kodur.**—The total sales in the year amounted to 8,432 plants, including 4,529 budded *citrus* plants and 2,774 mango grafts. In addition to the training of 5 persons in nursery practices for periods ranging from 5 to 95 days, three casual coolies also underwent training in grafting and budding operations. Budders deputed from this nursery inserted 5,230 buds in three private nurseries. One casual coolie was also sent to an orchard in Adoni for two months for extending the plantations. The services of two casual coolies were frequently requisitioned by private nurserymen near Kodur. The receipts from nursery during the year amount to Rs. 5,232-10-0 excluding Rs. 524-11-0 being the value of transfers and plants utilized for training, while the value of plants on hand has been estimated at Rs. 15,950. Taking the scheme as a whole from its inception, it has been worked out that a net profit of 469 per cent has been realised as on 30th June 1945.

3. **Botanical Garden, Coimbatore.**—The new introductions during the year consisted of a few plants in each of *Auraecarias*, *Cypresses*, *Bougainvillias*, and *crotons*, seeds of 41 varieties of annuals, 7 varieties of ferns, 6 of orchids, 13 of *chrysanthemums*, besides 158 plants of 114 different shrubs and trees. A separate plot for wild allies of cultivated plants was established with material collected from several sources. A mass grouping of potted plants of assorted kinds has helped in brightening the appearance in dry and off-seasons. The sales during the year included 705 oz. flower seeds, 2,764 cuttings, 527 bulbs and 1,309 potted plants.

4. **Vegetables.**—Fourteen varieties of ten different European vegetables have been selected as the most promising from the year's observation at the Pomological Station, Coonoor. The suitable seasons for each of these have also been tentatively determined. Cabbage seed production was intensified in the year with gratifying success. A fairly good crop of seed has also been gathered from the "Pomocol" cauliflower isolated in this station previously. The total number of plants sold in the year came to 2,666.

At the Agricultural Research Station, Anakapalle, vegetables were grown as inter-crops in the orchards mainly for the production of seeds, and 194 lb. 8 oz. of seed were collected in addition to the sale of 46,570 seedlings of brinjals, tomato and chillies. Five successful crosses in brinjals were obtained and the seeds of these have been sown.

At the Agricultural Research Station, Pattambi, an acre yield of 6,400 lb. of tubers of such root crops as yams, colacasia and *Discoria*

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batata was obtained. A pumpkin variety, Vallarimathan, has proved very prolific, requiring only 80 days from seed to harvest. Thirty pounds of its seed were distributed during the year. Its acre-yield has been estimated at 18,770 lb. Crosses between gourds were unsuccessful but a few successful crosses between Vellarimathan and the ordinary pumpkin succeeded, though the seeds in these were all shrivelled. Tomato proved a failure on the station due to the prevalence of wilt.

At the Agricultural Research Station, Maruteru, a number of reciprocal crosses were attempted on two varieties of beans, and these resulted in 5 set pods. Knol kohl, carrot, lettuce, French beans, beetroot and radish have done well on the station, while cabbage was a failure. Viable seed has set in carrot, radish, lettuce and French beans.

At the College Orchards at Coimbatore, twenty different kinds of vegetables were raised mostly as inter-crops in orchard areas. Six varieties of pumpkins were introduced for the first time. Certain cyto-taxonomic studies on cucurbits were initiated by the Assistant Government Lecturing and Systematic Botanist. A vegetable park was maintained as in previous years. The Government Entomologist has found here that Minnesota fly-trap with baits like mashed up guava and banana were the most efficacious in controlling the fruit fly, which was specially severe on gourds during the year. In all, 1,040 ozs. of vegetable seeds were distributed in the year.

At Guntur orchard area also, vegetables were grown as inter-crops mainly for seed production. Bhendi and tomatoes yielded 56 lb. and 37.5 lb. of seeds, respectively, from 10 cent plots each. In all, 131.5 lb. of vegetable seeds were produced and sold, besides 9,000 seedlings of tomato and brinjal.

V. MISCELLANEOUS.

Works.—In addition to the annual repairs to buildings, special repairs to the Taxonomical quarters at the Fruit Research Station, Kodur, at a cost of Rs. 1,120 was executed departmentally. Detailed plan and estimates for special repairs to eight buildings at Kodur and for three special works at Coonoor were also submitted.

2. *New schemes.*—A list of the more important new schemes, prepared and submitted during the year, is given below :—

(1) Detailed proposals for the extension of the Kodur Fruit Research Scheme for five years with a complete report of the work done during the past nine years.

(2) A scheme for the training of malis.

(3) A scheme for the trial of fruits in Aruku valley.

(4) A comprehensive scheme for the development of fruit industry in the post-war period.

3. *Exhibitions.*—Exhibits of seasonal fruits, vegetables, spices and some placards and posters were sent to 9 different exhibitions from Kodur, 13 from Kallar, nine from Burliar and 11 from the Pomological Station, Coonoor.

4. *Eat More Fruit Campaign.*—A provincial fruit show was organized at Madras on 27th and 28th January 1945 in conjunction with the annual flower show of the Agri-Horticultural Society. The show attracted over 5,000 visitors, among whom there were a very large number of keenly interested growers and many distinguished persons including Her Excellency the Hon'ble Lady Hope. The decorated fruit stall put up by the section formed the chief attraction of the show.

Under the scheme of financing the regional shows by the Government, three fruit shows were organized during the year at Vizianagaram in October, at Kodur in November and at Trichinopoly in December. A total number of over 11,000 visitors visited these and evinced great interest in the exhibits. In particular, the off-season mangoes and sapotas at Vizianagaram and the extensive array of fruit dishes for dinner and tea parties at Kodur formed the main attractions.

Encouraged by the popularity and value of the above exhibitions, one more regional show was organized during the year at Bhikshandarkoil, mainly with funds voluntarily contributed by the President of the Trichinopoly Agricultural Association. Over 1,000 persons visited the show.

A departmental fruit stall was also put up at the Pachaiappas College, Madras, to synchronize with the session of the Madras Provincial Co-operative Conference in October 1944. Nearly 1,000 persons visited the stalls.

5. *Lectures.*—Four lectures were delivered at the regional fruit shows on different aspects of fruit production.

6. *Posters.*—One draft folder, one draft calendar and one poster on vegetables were prepared and submitted.

7. *Publications.*—(a) The following notes were prepared and published during the year :—

(1) Cabbage seed production by U. Narasinga Rao—*Indian Journal of Horticulture* II, No. 1, June 1944.

(2) Mangosteen Propagation by K. C. Naik, *ibid.*

(3) Rootstocks for Acid Lime by K.C. Naik, *ibid.*

(4) Fig Pollination by C. Bhujanga Rao, *ibid.*

A note on the need for increased production of fruit and vegetables was prepared and submitted to form a basis for discussion in meeting of the Provincial Food Council.

(b) The following is the list of articles prepared for publication during the year :—

(1) Promising fruits by K. C. Naik for the Villagers Calendar and Guide, 1945.

(2) Promising Vegetables on the Hills by K. C. Naik for the above journal.

(3) Vegetable Seed Growing for the Grow More Food Journals.

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(4) Fruits Interview the Food Administration by K. C. Naik for the Grow More Food Journals.

(5) A draft on the Origin and Achievement of the Kodur Fruit Growers Co-operative Society was also prepared at the request of the Co-operative Department for issue as a leaflet.

(6) Fruits in Food Planning by K. C. Naik for publication in "Nutrition" magazine of the Central Food Department.

(7) Results of work done in the past five years for publication in the Grow More Food Journals.

(8) Curing of Persimmons by U. Narasinga Rao for publication in the Indian Journal of Horticulture.

(9) to (15) Seven articles with short notes on each of the more important fruits and with seasonal hints for fruit cultivation as well as with selected questions and answers were also prepared and published in seven successive issues of *Mezhi Chelvam*.

(16) Importance of Vegetables by K. S. Venkataramani, Post-Graduate student in the section, was published in *Padi Pantalu* for October 1944.

(17) Why Fruits should be included in our Dietry by K. C. Naik was published in *Mezhi Chelvam* for March 1945.

8. *War efforts*.—Mr. James Colaco, Assistant, Pomological Station, Coonoor, is actively engaged as a Lieutenant in the Royal Indian Navy Volunteer Reserve.

Mr. G. Chandrapaul, ex-Farm Clerk, Fruit Research Station, Kodur, is actively engaged in the communication branch of the Royal Indian Navy.

Saheb Oosman, Peon in the Office of the Fruit Specialist, Kodur, is believed to be engaged in His Majesty's Land Forces. O. Samuel and Paul, coolies at the Fruit Research Station Kodur, are actively engaged as War Technicians.

Work under the Banana Fibre Scheme reported elsewhere forms also a part of the War effort of the section inasmuch as the object of the scheme is to find out sources of supplying marine cordage which has become scarce as a result of the unavailability of Manila hemp.

On request from the Collector of Cuddapah, I visited sites selected for colonization of demobilized soldiers at Settigunta and discussed with him the manner of examining the soils before the sites are finally allotted to the men for fruit growing.

A sum of Rs. 60 towards the Defence Savings Provident Fund, Rs. 19-15-6 towards the Governor's War Fund, Rs. 5,000 towards the National Savings Certificate formed the monetary contributions by the members of the staff. In addition, a sum of Rs. 5-7-0 was also contributed from the hundi collections.

A group of Military Officers from Coimbatore were given hints as to the methods of increasing food output.

KODUR,
30th July 1945.

K. C. NAIK.
Fruit Specialist.

ADMINISTRATION REPORT OF THE GOVERNMENT
AGRICULTURAL CHEMIST FOR 1944-45 (FASLI).

I submit herewith the administration report of my section for the fasli year 1944-45.

I continued to be in charge of the section throughout the year. Sri M. R. Balakrishnan was promoted to the newly created post of Gazetted Assistant in Chemistry and Sri V. V. K. Sastry was appointed Chemist in the scheme for the production of rubber from *Cryptostegia Grandiflora*. The control of the botanical section of this scheme was transferred from the Government Lecturing and Systematic Botanist to me.

The work of the section is, as usual, reported under three main heads—

I. General, including Analytical and Advisory work,
II. Teaching and III. Research.

I. GENERAL.

Weather.—Meteorological observations were recorded as usual at the Institute Observatory. The south-west monsoon was weak throughout but the north-east monsoon more than compensated for the deficit, the total rainfall being in excess of the normal by 8.54 inches.

Analytical and Advisory.—Two thousand and eighty-one samples of all descriptions were analysed and reported on during the year on requisition from other Officers of the Agricultural Department, from other Government Departments, ryots and other private parties and business concerns. A sum of Rs. 837 was received as analytical fees for samples received from private sources. The investigations conducted by this branch included (1) the food value of hill types of red gram as compared with the cultivated varieties, (2) the possibility of preparing milk substitutes from vegetable sources such as pulses and oil-seeds and (3) the causes of wide variation in nitrogen content of safflower cake samples.

II. TEACHING.

Two hundred and thirty-three lectures of one hour duration each were delivered and 241 practical classes of two hours each were held for the classes of the B.Sc. course. Owing to increase in the number of admission to the first year course to 96, the practical classes for that course were held in batches. No admissions were made for the short course during the year. Three students were admitted to the post-graduate course, and are engaged in research.

III. RESEARCH.

A. Soils.

Fundamental studies on the origin and properties of black and red soils of the Madras Presidency.—This study has been going on for the past two years during which the characteristics of black and red soils from different geological formations have been studied in detail. This year's study was confined to the black soil from Cretaceous formations as found in the Ariyalur area of the Tiruchirappalli district. As far as data have been collected, the soil appears to be similar to the black soils with and without gypsum as found in the other areas in regard to its salt contents and PH. The mechanical fractions are being separated for detailed study.

Dehydration studies on the clays from black and red soils at low temperatures show that (1) up to a temperature of about 50° C. the clays behave alike, (2) the red clays have a lower moisture absorption capacity than the black clays, and therefore (3) the higher moisture absorption capacity of black soils is more due to the nature of the clay than the absolute clay content.

2. *Soil survey of the Gandikota Project area.*—It has been proposed to utilize the flood waters of Pennar for raising dry crops by constructing a dam at Gandikota and in the first instance to open an experimental farm in a typical deep black soil area to study the effect of light irrigation on this soil with the Pennar water. The periodical analysis of the flood waters of the Pennar has revealed the presence of injurious salts like sodium bicarbonate and chloride as its main constituents. A rapid survey of the typical deep black soil area in the ayacut of the project shows that the soluble salt content of the surface soil is high, and rises with the depth. Sodium bicarbonate is the predominant salt, and has caused a high PH in the soil. The composition of the soil and water have created a special problem and call for extreme caution in the introduction of irrigated cultivation in these areas.

3. *Studies on cultural practices in relation to soil structure.*—The study of soil tilth as measured by the aggregate distribution in the soil was taken up with black and red soils under different cultural treatments in the Cotton Breeding Station at Coimbatore. The determination of total surface area by sieving tests on samples collected at monthly intervals shows (1) that there is a similarity in the fluctuations of surface area due to seasonal effect in all the treatments, the maximum being in August and January and the minimum in November, (2) the implements used have a profound influence on the increase in the surface area due to treatment, working the victory plough once and the country plough once (standard) causing the greatest amount of pulverisation in both the soil types. The effect of the treatment is more pronounced on the black soils than on the red.

4. *Soil moisture studies at the Agricultural Research Station, Nileshtar.*—It has been observed that the burying of coconut husk between rows of trees at the Agricultural Research Station, Nileshtar has the effect of increasing the yield of nuts. In order to see if this was due to increased retention of soil moisture, observations were taken at monthly intervals from December, 1944. The results obtained showed that till the commencement of the hot weather the plots in which husk was buried showed a higher moisture content than the controls.

5. *Reclamation of alkaline soils under dry conditions.*—The experiments started at Peddapalakalur and referred to in my previous reports did not proceed apace due to unavoidable difficulties. During the year they were revived, particular attention being paid to details like (1) the fencing of the experimental area, (2) exclusion of outside water from the experimental plots, (3) deepening and maintenance of the main and subsidiary drains, (4) the application of 40 tons of farmyard manure to the plots (except control) in two doses instead of one, and (5) the sowing of a green manure crop (Dhaincha) during the year. A demonstration maistry will be in charge of the operations.

B. Manures and Manuring.

Permanent manurial experiments.—(a) the old permanent manurials had a crop of fodder cholam (rainfed). Yield data for dry fodder showed that (i) the complete manure (N + K + P) plot gave the highest yield (ii) nitrogen alone or in combination with phosphoric acid or potash gave yields higher than phosphoric acid or potash alone or in combination with each other, showing that nitrogen is the limiting factor in straw yields and (iii) cattle manure gave about the same yield as the nitrogen plot.

(b) In the new permanent manurials, ragi was sown in July and harvested in October 1944. The next crop, cholam A.S. 809 was sown in March 1945 and is ready for harvest. The figures for the yield of ragi (grain) show (1) that this crop had benefited by the application of a basal dressing of cattle manure in combination with artificials as evident from the generally high yields in the Western Series, (2) the phosphate plots in both the series have as usual given significantly higher yields of grain than the no-phosphate plots.

2. *The conversion of estate rubbish and nightsoil into compost and field trials on its manurial value.*—Composting of estate rubbish and nightsoil was started in Field No. 37, Central Farm, in May 1944 and continued till September 1944. During this period 12 pits, each 15 feet by 5 feet by 3 feet, were filled. The bottom layers in the pits took about 8 months to thoroughly decompose, and the top layers attained this condition two months earlier. Comparative trials with compost and farmyard manure applied

at different levels of dosage, viz. 0, 5, 10 and 15 tons per acre, are being made in Field No. 43 (b) of the Central Farm, the crop selected being ragi. The experiments are in progress.

3. *Storage of Farmyard Manure.*—This experiment was started with a two-fold object, viz., (i) whether farmyard manure stored under the different systems—Pit with and without cover and heap—differed in manurial value and if so to what extent, and (ii) whether manures so collected showed responses to crop yield proportional to their chemical composition. Analysis of samples from the different systems both at the start and at the close of the storage period showed a remarkably consistent percentage of conservation of nitrogen placed under storage in spite of the widely varying conditions of the three systems. The total quantity of nitrogen actually stored under the three systems is about 33.6 lb. and a uniform loss of 14.9 lb. N. i.e., about 44 per cent of the nitrogen stored was indicated in all the systems. The loss was greater than the maximum recorded in other places in spite of a favourable C:N. ratio (40:1) and may be attributed to conditions favourable for denitrification.

The relative crop producing powers of the manures were tested on a crop of late ragi in Field No. 49 of the Central Farm during September–December 1944. Owing to unfavourable seasonal conditions the growth of the crop was poor, the average yield of grain being 800 lb. The differences between the treatments were not statistically significant.

The residual effect was tested on a crop of summer cholam sown in March 1945. Here also the differences in yield between the treatments were not statistically significant. The storage of manure was started again in August 1944 on the same lines, and the experiments will be continued.

4. *Comparative study of green manure crops.*—The study of the four green manure crops, viz., Dhaincha, sunn-hemp, pillipesara and Cowpea in respect of their yield of green matter, decomposability, and effect on paddy yield, was continued during the year. The crops were raised in the central Farm, ploughed in situ after recording green weights and taking samples for analysis and the different plots transplanted with paddy CO₂. Data collected go to show that in general, the yield of green matter and decomposability determine also the yield of paddy.

5. *Organic matter decomposition experiments.*—The field experiments conducted at Siruguppa were continued this year also. Analysis of the last round of samples taken from the irrigated and dry plots one month after harvest gave results which confirmed the previous observations, viz., (a) comparatively more accumulation of organic matter and nitrogen (20–25 per cent) in the green manure treated plots, (b) the maintenance of the carbon/nitrogen

ratio at a low level (12.1 to 16.7) and a close agreement of the oxidation values with organic carbon figures, indicating the absence of reducing agents other than well decomposed organic matter.

Pot culture experiments were also carried out at Coimbatore to follow the nature and extent of decomposition of organic materials of varying C/N ratios, viz., Sunn-hemp, paddy straw, groundnut cake, and cattle manure—both in presence of super and super plus Ammonium sulphate. The object was to see how far Super enables the preservation of organic matter added to black soils under irrigation when applied alone and in combination with easily available nitrogenous manures like ammonium sulphate. The progress of decomposition of organic matter is being followed for a total period of 60 days at the end of which the data collected will be examined and the role of super in preserving the humus and nitrogen content of black soil treated with different kinds of organic matter will be discussed.

6. *Utilization of Tiruchirappalli phosphate as fertiliser.*—Pot cultures with paddy were carried out with a view to assess the relative fertiliser values of Tiruchirappalli phosphate raw and as processed at the Indian Institute of Science. The efficacy of the phosphates applied at 75 lb. per acre was tested in the presence of ammonium sulphate at 20 lb. nitrogen per acre as also with a mixture of green manure and ammonium sulphate supplying the same amount of nitrogen (20 lb.) in the proportion 3:2. The control received 20 lb. nitrogen as ammonium sulphate alone. Statistical analysis of the yield of grain revealed a significance for the treatment Tiruchirappalli phosphate processed plus ammonium sulphate plus green manure. When applied alone Tiruchirappalli phosphate in any form does not seem to be better than the control receiving ammonium sulphate only. The results further show that Tiruchirappalli phosphate processed and raw, as well as super, behave more or less alike in the presence of a mixture of ammonium sulphate and green manure supplying Nitrogen in the ratio 2:3 respectively. The control, ammonium sulphate alone, gave the maximum yield of straw.

C. Plant Chemistry.

Investigation on the viability of Kolinji seeds.—The object of this investigation was to find out ways and means of improving the poor germination capacity of Kolinji seeds sown as green manure under normal conditions. The seeds are being given different treatments prior to germination tests. Physical treatments consist in (a) injuring the seed coat by sand polishing and pounding in a wooden mortar, (b) exposing to dry heat at different temperatures, and (c) soaking in hot water at different temperatures. Treatments (b) and (c) are being carried out for varying periods. Chemical treatment consists in steeping the seeds in different strengths of sulphuric acid, caustic soda and lime water for varying

periods and at different temperatures. In addition, treatment with gases like carbon dioxide and oxygen, oxidising agents like Hydrogen peroxide, and hormones and vitamins are also contemplated.

Seeds were obtained from Tanjore and Nellore, but the former have been used for the trials on account of their comparatively better germination capacity. The results obtained so far show that treatment with concentrated sulphuric acid for 5 minutes has given the maximum percentage of germination (40 per cent)—an increase of 100 per cent over control—within three days. The next most efficient treatment is with 20 per cent sodium Hydroxide for 30 minutes, the per cent germination under this treatment being 29.5. The work is in progress.

2. *The chemical basis of disease resistance—a study of the resistance of the paddy plant to Pyricularia.*—This study has been taken up in view of the existence of strains of paddy that are resistant to Pyricularia. A.D.T. 10 is one such strain, and its chemical composition is being compared with that of CO.4, one of the susceptible strains. The results of analysis done so far show that with the exception of nitrogen, initial moisture and silica contents, no differences in chemical composition are found to exist. The work is in progress.

3. *The effect of nitrogenous manure and salinity in irrigation water on nitrogen and mineral matter in sugarcane juice.*—From previous experiments indications were obtained that chlorine in irrigation water caused an increase in the nitrogen content of the juice. To get more definite data on the above, pot culture experiments were started in August 1944, the treatments being irrigation with rain water, Estate tap water (brackish) and water with 500 parts common salt per 100,000, each of these with and without top dressing of nitrogenous manure at 100 lb. nitrogen per acre in the shape of ammonium sulphate. The analysis of the canes is in progress.

4. *The composition of jaggery and its bearing on keeping quality.*—Evidence presented so far by previous workers regarding the influence of salts, reducing sugars and organic non-sugar on the keeping quality of jaggery has been of a conflicting nature. Experiments were conducted with a view to obtain definite data on this point.

Starting with sucrose solutions or cane juice which were boiled down with or without the addition of chlorides and sulphates of sodium, potassium and calcium, glucose and fructose, it was found that chlorides caused considerable increase in the moisture holding power of jaggeries but the sulphates, excepting that of Sodium did not have such a deleterious effect. Fructose was also much worse in this respect than glucose.

Further experiments in which a particular ingredient or ingredients were removed from jaggery of known composition by treatment with suitable organic solvents, gave similar conclusions, viz., that the Glucose and chlorine contents exercise a profound influence on the keeping quality of jaggery and that gums and nitrogenous substances play a minor role in this respect.

5. *Preparation of light-coloured jaggery without the use of activated carbon.*—By immersing the cane in boiling water for 3 to 5 minutes, crushing and clarifying the juice with wild vendai juice and boiling down as usual, it has been possible to obtain a light-coloured jaggery which very nearly approached the standard of cream jaggery. The trials were made on the variety CO.3 on a laboratory scale, and it is proposed to conduct large scale trials on other varieties.

D. Animal Nutrition.

The pasture value of giant star grass (cynodon Plectostachyum).—This grass has vigorous growth habits and offers possibilities of meeting the enhanced fodder requirements of this country. Analysis shows that it has good feeding value, but its varying hydrocyanic acid content at different stages of growth has given rise to fears about its popularity as a fodder grass. Estimation of this constituent at different stages of growth of this grass has shown that its maximum hydrocyanic acid content at any stage is well below the toxic limit. Feeding experiments conducted with this grass grown under irrigated and dry conditions and cut at different stages of growth have shown that the bullocks experimented with relished the grass either in the fresh or wilted condition, did not show any symptom of toxicity and maintained normal health and body weight.

2. *Digestibility trials with local fodders and feeds and the formulation of detailed rations for the major cattle zones.*—In connection with this investigation a detailed cattle survey of the Kangayam tract was started and the whole of Erode taluk and a portion of Dharapuram taluk were traversed. Detailed information regarding the care and conditions of cattle marked for different purposes was gathered and samples of fodders, concentrates and drinking water were collected. The samples are being analysed.

E. Microbiology.

Studies of the microbiological population of black soils as influenced by irrigation.—Field studies on this subject were continued at the Agricultural Research Station, Siruguppa, and the analysis of the third round of post-irrigation samples was completed during the year. Of the various kinds of analysis which the soils were subjected to, it was found that CO₂ evolution gave a very fair index of the fertility of the soil and had a direct correlation with crop production. Irrigation had the effect of stabilising the bacterial population of the soils.

F. Agricultural Industries.

Manufacture of agar-agar from Sea-weed.—Work done during previous years has shown that agar-agar of B. P. standard could be prepared from the sea-weed, *Gracilaria Lichenoides*. The possibility of producing this material economically and the suitability of Coimbatore agar for the preparation of bacterial media as compared with imported brands of agar were the items taken up for investigation during the year. After testing with various strengths of hydrochloric acid used for washing out calcareous deposits from the raw weeds, it was concluded that steeping in 0.5 per cent acid for 15 to 30 minutes was sufficient for maximum production at minimum expense. The process of bleaching the weeds by alternate wetting and sun-drying was found to be indispensable, as the omission of this process led to poor quality and decreased production of agar.

Media prepared from Coimbatore agar, china grass (Hopkins and Williams' Straw) and "Difco" Brand agar were used for cultures of different kinds of bacteria. The counts obtained from Coimbatore agar were higher than that from China grass and equal to or higher than that from 'Difco'. To obtain the same degree of hardness or firm jelly as 1 per cent Coimbatore agar, 2 per cent 'Difco' and 5 per cent China grass had to be used, indicating that the local product could be used more economically than the foreign brands of agar. The Coimbatore agar had another advantage over the others in that it was not as much coloured by the nutrients, thereby rendering it possible to differentiate the normal colours produced by different bacteria.

2. *Malt products from cholam.*—(a) Experiments on the preservation of malt food and malt extract from cholam were continued during the year. It was found that to prevent insects breeding in the malt food a concentration of at least 25 per cent of CO₂ on the absolute air space of the container should be maintained for a minimum period of 48 hours, and that this could be accomplished by packing the bottles rather loosely and sealing them off with discs of tissue paper and carboard dipped in paraffin after CO₂ treatment.

Malt extract was found to preserve well, free from fungus attack, if its specific gravity and reducing sugar content were maintained over 1.40 and 60 per cent respectively.

(b) By treating starch from cheaper sources with green malt from cholam it was thought possible to bring down the cost of production of malt extract. Starches from potato, tapioca, arrow-root, sweet potato and maize were utilised for this purpose with success, the extract obtained comparing favourably with the factory product. Maize appears to have possibilities since it is a short duration crop and may serve as a continuous source of starch supply.

3. *The manufacture of active carbon from paddy husk.* The large scale manufacture of active carbon from paddy husk has become necessary in view of the demand for this material for purposes other than clarification of cane juice. The equipment has been transferred to my charge from the Superintendent, Malt Factory, and the necessary improvements have been made in the furnace.

4. *The production of rubber from Cryptostegia Grandiflora.*—(a) Botanical work on this subject consisted in studies on the regeneration of drastically pruned vines and the seasonal variations in yield of plug rubber at Bannur and at Coimbatore. Pruning studies of rubber vines of unknown age at Bannur have shown that an abundance of foliage is produced in about 2 months. The weight of 1,000 plugs at Bannur varied from 51 grams in June-July to 25 grams in May. The yields at Coimbatore were found to be higher, probably due to less of defoliation in dry weather, thicker shoots, regional effect and probably to the fact that tapping was commenced later.

(b) Chemical work consisted in (i) observations on the yield and quality of rubber under dry and irrigated conditions (ii) trials on the anaerobic fermentation of leaf material as a means of increasing the extraction of rubber (iii) examination of the suitability of *Cryptostegia* rubber for the manufacture of products of common utility and (vi) investigations on the suitability of the plant as green manure.

(i) Experiments at Coimbatore with plants of known age have shown that the yield and quality of rubber from irrigated plots is higher than that from the unirrigated. Variations due to seasonal changes are also indicated, but data obtained are insufficient for definite conclusions.

(ii) Preliminary experiments on the anaerobic fermentation of leaf material show that such fermentation helps to soften the leaf material and increase the proportion of rubber in the leaf. Treatment with alkali and steam are necessary for the liberation of rubber and the exact conditions have to be worked out.

(iii) A number of mixes were tried to judge the suitability of *Cryptostegia* rubber for products of common utility. The products were of good quality and the mixes were easy to handle.

(iv) Analyses of leaf material and prunings of *Cryptostegia* have indicated the suitability of this plant as a source of green manure. A detailed investigation of this aspect is contemplated.

G. Publications.

The following original contribution have been submitted for publication :—

I. Nature and distribution of organic matter in the Tungabhadra project area (Indian Science Congress held at Nagpur in January 1945).

Part I.—Carbon and Nitrogen in typical Profiles of the project area

Part II.—Nature of organic matter in typical profiles of the project area.

Part III.—A note on the estimation of organic carbon in black soils of the project area.

II. Studies on the quality of potato in the Kotagiri and Ooty areas. (Indian Journal of Agricultural Science.)

III. A note on pasture value of giant star grass (by Government Agricultural Chemist and Government Lecturing and Systematic Botanist).

IV. Influence of the quality of irrigation water [channel water *versus* Effluent] and method of preparation of rice flour on its nutritive value [Madras Agricultural Journal].

V. "Feeding of Dairy Cows" in Tamil (Mezhichelvam).

VI. Review of experiments done on cultivation at the Agricultural Research Stations in Madras Province.

COIMBATORE,
7th August 1945.

H. SHIVA RAO,
Government Agricultural Chemist.

ADMINISTRATION REPORT OF THE GOVERNMENT ENTOMOLOGIST FOR THE YEAR 1944-45.

I. CHARGE.

I was in charge of the Entomology section throughout the year except for a month when I was away on leave on average pay during which period Assistant Entomologist Sri T. V. Subrahmaniam was in full additional charge of the office.

II. ADVISORY.

During the year under review 935 enquiries were received; of these 366 were attended to by the headquarters staff and the rest by the Entomological-cum-Mycological staff stationed in the districts. Control of crop pests and bee-keeping were the major items attended to. The more important pests dealt with are mentioned under item "Propaganda and campaign" (Detailed report).

III. TEACHING.

Sixty-five lectures and fifty-five practical classes are held for the B.Sc. (Ag.) First year and thirty-six lectures and twenty-seven practical classes for the second year. Two batches of the bee-keeping course were given thirty lectures and thirty practical classes and thirty-one lectures and thirty-one practical classes respectively. Seven lectures and seven practical classes were held for the sepoy.

IV. SPECIAL INVESTIGATIONS ON CROP PESTS AND THEIR CONTROL.

Sugarcane borers (Argyria, Diatraea and Scirpophaga).—The range of incidence of Argyria varied from 13.9 per cent to 16.1 per cent. The results of the observations made so far indicate that a higher temperature and a lower humidity in April-May is congenial for its prolific oviposition. The incidence of Diatraea ranged from 8.6 per cent to 15.5 per cent. The pest makes its appearance during the more humid months in June-July and gets severe with the growth of the crop. It requires more humid conditions than Argyria for its proper multiplication. Scirpophaga incidence was light, it was found in small numbers throughout the year. Of the three varieties studied, i.e., Co. 413, Co. 419 and Co. 421, the second was more susceptible than the first and third. The average number of tillers formed per mother plant ranges from 4.6 to 6.7 for the three varieties. The average number of dead hearts caused by borers and mortality by other agencies amounts to 2.8 to 5.4 and the average number of canes that comes to harvest

is from 1.2 to 1.8 per mother plant for the varieties. The data also show that the bulk of the mature canes develop from shoots that emerge up to the end of July. Studies were made on the alternate host plants. *Saccharum spontaneum*, *S. arundinaceum*, *Arunda donax*, *Pennisetum Hockenhackeri* and *Eleusine coracana* (ragi) were examined during the year. The first was found to harbour *Busseola* and *Scirpophaga* and in small numbers *Diatroea*. The following parasites were noted:—*Tricrogramme minutum* and *Telenomus beneficiens* were reared from the eggs of *Argyria* and *Diatroea*. *Apanteles flavipes* was reared from *Argyria* and *Diatroea* caterpillars; *Stenobracon deesa* from *Argyria* caterpillars; *Rhaconotus rolinensis* from *Diatroea* caterpillars and *Rhaconotus scirpophagae* and *Elasmus zehntneri* from *Scirpophaga* caterpillars. Stubbles and tillers left over from the previous crop were examined weekly for five consecutive weeks after harvest and the borer population worked out to an acre basis. It was 1,143; 3,200; 3,692; 2,000; 2,400 respectively for the five weeks. The population comprised of *Argyria* caterpillars and was found only in the shoots. Trials for the control of borers consisted of earthing up of young canes and liberation of the egg parasite *Trichogramma*. The first was conducted in replicated plots with four sets of control and treated ones; the variety being the local Poovan. The planting was done in the first week of September and the earthing up given by the end of the month when the crop was three weeks old. Regular fortnightly counts on borer incidence were taken from October onwards till the end of February. The results of the experiment are not conclusive since the treated and control plots did not show any striking difference on borer infestation. As in the previous year the parasite liberation trials were conducted at Nellikuppam, the egg parasite—*Trichogramma* being multiplied at Coimbatore and sent by post. The releases were at the rates of 8,000 parasites per acre. The effect of the liberation was studied in three-acre plots. The percentages of parasitisation in the control, six liberation and twelve liberation plots were 24.6, 40.7 and 29.3 respectively and the yields per acre 21.29, 28.85 and 24.63 tons respectively. The cost of treatment was Rs. 12 and Rs. 24 for the six and twelve liberations respectively. Deducting the charges for parasite releases the net gain for the six and twelve liberation plots is Rs. 169 and Rs. 56 at Rs. 24 per ton including the bonus paid by the Company.

2. *The paddy mealy bug* (*Ripersia oryzae*).—Control trials, i.e., scorching of the grass growth on nursery bunds before sowing and transplanting the seedlings in fields were continued at the Agricultural Research Station, Aduthurai. Statistically significant results were obtained regarding the incidence of the pest. Trends of increased yield were obtained in bulk plots of Samba crop.

3. *The paddy stem borer* (*Schoenobius incertellus*).—Studies on the flight range were continued by marking and releasing the moths at different distances from the light. They were found to

be attracted to hurricane lights from a distance of 150 yards. Due to scarcity of kerosene oil for light traps, trials were made with vegetable oils. It was found that cotton wick light with groundnut oil was able to attract moths and was 80 per cent as efficient as the kerosene light.

4. *The cholam earhead bug* (*Calocoris angustatus*).—Different cereals and grasses were examined for alternate host plants. Nymphs of the bug have been collected from a grass—*Dinebra retroflex* panz. Trials with D. D. T. and 666 have given very interesting results. Nymphs and adults die as a result of dusting the earheads. The dust is found effective even for fresh nymphs emerging from eggs. In 24 hours there is 95 per cent and more death. Small scale field trials have shown good setting of earheads when dusted with D.D.T. and 666 at a strength of 0.006 per cent. Arrangements have been made to carry out large scale trials.

5. *The chillies thrips* (*Scirtothrips dorsalis*).—Since tobacco dust which is found as an effective insecticide has gone up in price due to war conditions, trials to find out cheaper insecticides were in progress. It was found that *Lobelia* decoction and *Thevetia* emulsion were effective in varying degrees in controlling the pest but these were not as good as tobacco decoction. Two per cent D.D.T. dusted under Laboratory conditions has been found to give cent per cent mortality in 24 hours. Field trials will be taken up during the season.

6. *The brinjal bud worm* (*Phthorimoea blapsigona*).—The treatments tried against the pest consisted of spraying with tobacco decoction, calcium arsenate plus lime, Bordeaux mixture and *Thevetia* extract and were randomized with suitable controls. The incidence figures were statistically significant, *Thevetia*, Calcium arsenate plus lime and Bordeaux mixture being better, in the order given, than tobacco and control. Fort-nightly treatments were not superior to monthly treatments. Yield figures were not significant.

7. *The citrus leaf miner* (*Phyllocnistis citrella*).—This is a serious pest especially of seedlings and young plants. Insecticidal trials repeated during the year have confirmed the previous results viz., the superiority of tobacco extract as a toxic agent and of *Thevetia* extract as deterrent. Fortnightly spraying was not found superior to monthly spraying. Varietal resistance studies conducted at the College orchard have shown that no variety was immune from attack of the miner and acid lime was the least attacked.

8. *The mango hopper* (*Idiocerus* spp.).—Dusting of sulphur and spraying of fish oil rosin soap were repeated during the season against the pest. It was found that dusting of sulphur gives better results than spraying of fish oil rosin soap as judged from the number of fruits on the trees.

9. *The apple woolly aphid* (*Eriosoma lanigera*).—The performance of the parasite—*Aphelinus mali*—was studied at the Pomological Station, Coonoor. The degree of parasitisation ranged from 44.5 per cent to cent per cent. It was found that the parasite is not able to keep pace with the pest especially in its swarming stages; sprayings were therefore undertaken to supplement biological control. Of the insecticides tried, Nicotine sulphate, Lobelia and Thevetia gave useful results. The total lifecycle of *Aphelinus* was 44 days and the maximum longevity 37 days. Two other natural enemies—a Syrphid and a species of *Chrysopa*—were also noted during the year; the former was found only in summer months. Consignments of *Aphelinus* sent to Kodaikanal and Shembaganoor have successfully established themselves there.

10. *The San Jose Scale* (*Quadraspidiotus perniciosus*).—The pest is found mainly in the Coonoor and Kotagiri areas on apples, peaches, plums, pears and quince. Fish oil rosin soap at 1 lb. in 5 gallons of water is giving satisfactory results. As a result of spraying, the number of infested plants in the Pomological Station, Coonoor has been reduced from 121 to 25. There was a similar improvement in the situation at Nitens and Asoja estates in the Kotagiri area. The nursery stock from the Pomological Station is issued only after fumigation. Two parasites—*Aspidiotophagus citrinus* and *Aphelinus* sp., have been noted on the scale. The maximum parasitisation has been 30 per cent.

11. *The coconut caterpillar* (*Nephantis serinopa*).—For the control of this pest at Tudiyalur, the Eulophid parasite *Trichospilus pupivora* was imported from the West Coast and reared in bulk at the Insectary. Parasite liberations commenced in September and were continued until the pest was brought under control by February 1945. In the course of about 6 months 1,03,000 parasites were liberated in the area. In about two months of liberation the introduced parasite began to establish itself in the coconut gardens. During March when the area was again examined, the pest had subsided.

12. *Redgram pod borers* (*Heliothis*, *Agromyza* and *Bruchus*).—The following treatments were tried in replicated randomized plots with suitable controls:—(1) Dusting tobacco powder and ashes, (2) dusting calcium arsenate and lime, (3) spraying crude oil emulsion and (4) spraying Thevetia emulsion. There was statistically significant increase in yield in the plots dusted with tobacco powder and in those sprayed with crude oil emulsion over the control plots. Incidence in seeds was significantly lower for tobacco dusted and Thevetia sprayed plots.

13. *The fluted scale* (*Icerya purchasi*).—Mass breeding of the predator—*Rodolia cardinalis*—was done in the stations in the Nilgiris and Kodaikanal. In all 11,600 beetles were liberated during the year, 7,900 in the Nilgiris and the rest in Kodaikanal,

with the result that the incidence of the pest is on the decrease where the liberations were done. Special attention was paid to see that the pest did not thrive on citrus. As a result of intensive studies, the following new hosts have been recorded:—(1) Walnut—*Juglans cordiformis*, (2) *Tephrosia vogelli*, (3) *Pinus longifolia*, (4) *Frenela rhombiodes*, (5) *Leucas suitruticosa*, (6) Plum, (7) Mulberry, (8) Pomegranate, (9) *Casuarina equisetifolia*, (10) *Cassia didymobotrya*, (11) *Achillea millefolium*, (12) *Buxus sempervirens*, (13) *Coreopsis grandiflora*, (14) *Erica mediteranea*, (15) *Plectranthus wightii*, (16) *Pogestomon wightii*, (17) *Melothria perpusula*, (18) *Senecio wighteanus*, (19) *Oenothera sinensis*, (20) *Helianthus tuberosa*, (21) *Conyza japonica*, (22) *Sphaeranthus indicus*, (23) *Oldenlandia auriculata*, (24) *Anaphalis travancorica*, (25) *Gnaphalium indicum*, (26) *Blumea neilghiriensis*. Inoculation, under caged conditions, of plants belonging to Rosaceae and Solanaceae is in progress to study whether these can serve as hosts of the scale. *Rodolia roseipennis*, *Stathmopoda melanochra*, *Scymnus* sp., a Reduviid bug and a cecidomyioid are the natural enemies other than *Rodolia cardinalis* noted but these are not so effective as *Rodolia cardinalis*. Studies on *Rodolia cardinalis* were continued. It has been ascertained (1) that the summer months are the most active periods for the predator, (2) the beetle is more adversely affected in the cold regions of the hills than in the warmer regions, (3) the use of a warm chamber can increase the fecundity of the beetle, (4) rearing of grubs in wooden trays is better than rearing in jars, (5) the lifecycle varied from 36 to 70 days. The egg period of the scale (*Icerya*) ranged from 29 to 48 days, the first instar from 29 to 34 days, the second instar 26 days and the third instar 42 days. In about a month more it begins to develop an egg sac and swarming continues over a period of one to two months. The scale is having only two generations in the hills. Strong winds are found to act as a good distributing agent of the swarming nymphs. Different hosts give different degrees of protection for the establishing nymphs against beating rains; gorse bush in particular was noted to afford a high degree of shelter for nymphs. Plant quarantine work at Mettupalayam and Shembaganoor was continued. The following are the interceptions made during the year:—*Eucalyptus*, citrus, apple, pear, plum, rose, verbena, *Hypericum*, *Helichrysum*, *Magnolia* and *Casuarina*.

V. INVESTIGATIONS ON STORED PRODUCT PESTS AND THEIR CONTROL.

The potato tuber moth (*Phthorimaea operculella*).—Studies on the control of the pest were continued at Coonoor and Nanjanad. At Nanjanad, tubers dusted with Acorus, Pyrethrum and Derris did not show any attack while those dusted with tobacco and the control showed 4.5 per cent and 11 per cent infestation. At Coonoor, tubers dusted with Derris, Pyrethrum, Acorus, tobacco

and control showed 0.7 per cent, 2.8 per cent, 6.3 per cent, 50 per cent and 83 per cent infestation respectively. Arrangements are being made to try lesser strengths of the first three insecticides.

2. *The pulse bruchids* (*Bruchus chinensis* and *B. analis*).—Control trials were continued and monthly counts taken of the incidence for the different treatment, viz., covering the seed with a layer of sand, dried *Ocimum* plants and mixing the seed with red-earth. The counts made in March after a lapse of 8 months gave 1.9 per cent, 74.8 per cent, 85.7 per cent and 84 per cent for sand layer, red-earth, *Ocimum* and control respectively showing the advantage of the sand layer method. Small scale trials with 2 per cent D.D.T. gave encouraging results.

3. *Pests of cholam malt* (*Tribolium sp.*)—Studies on heat and Co. 2 treatments for preservation of malt food against insects were continued. Exposure to 55° C. for 10 minutes gave complete kill of all the stages of the pest. It was found that *Tribolium* beetles fed with malt were capable of living up to 447 days.

4. *Pests of stored cholam* (*Calandra*, *Rhizopertha* and *Tribolium*).—Trials on the storage of cholam grains were continued. In mixing of the grains before storage in bags with almicide and magnesite at the rate of 1 lb. per 1,000 lb. of grains, almicide gave satisfactory results when examined at the end of 6 months, the percentage of loss in almicide being only 4, whereas it was 11.9 and 11.8 in magnesite and controls respectively. Mixing D.D.T. and 666 with the grains at 0.6 per cent by weight has given very good results in replicated trials in the laboratory. There was cent per cent mortality of *Calandra*, *Tribolium* and *Latheticus* in the course of 5 to 7 days. The residual effect of the insecticides was evident for 3 months. The treatment did not affect the germination of the grains. The effect of a layer of treated grains on the top of untreated bulk grains was studied with a view to avoid the mixing of all the grains thereby reducing the cost of the treatment. Very high percentage of mortality of the pest was obtained in the course of 4 days, 666 proving better than D.D.T. Dusting of the bags on the outside to save mixing of all the grains thereby reducing the cost of the treatment was found effective, especially in reducing infestation from outside where the grains were free at the time of storage. Dusting of bags with grains already infested did not prevent increase of the pest showing that dusting on the outside of bags was effective only with insect-free grains. The problem of storage of cholam grains in the silo built for the Malt Factory was investigated. The grains put in the silo during July 1944 showed maximum insect infestation by October. In the absence of Carbon-bi-sulphide, fumigation with cyanogas was done, but this did not prove quite effective as the gas did not penetrate deep enough. As germination of the grains was getting affected, the lot had to be removed by April.

5. *Pests of stored groundnut* (*Necrobia*, *Tribolium*-*Ephestia*).—The results of the control trials are given below :—

Sanitary measures.—The terminal storage centres are limited to a few important ports and the whole produce of the country parts is concentrated in the warehouses in these port centres. The presence of these stocks in the warehouses, throughout the year, helps the continuance of the pests. The groundnut godowns in Cuddalore have invariably a bedding of sand over which is spread coir matting with the groundnut bags stacked directly on it or with a gunny purdah over the coir mattings. This affords ample shelter for the insect pests breeding on the scattered materials on the floor of the godowns. General cleaning is difficult in such situations but the coir matting and gunny purdah can be taken out in an air-tight room and fumigater with Calcium Cyanide 'A' dust. Trials carried out with this fumigant have given high mortality of the pests. The Government owned godowns at Madras have hard flooring and these are found in a better sanitary condition than the sand-floored godowns at Cuddalore and Masulipatam.

Periodical sundrying.—The handling charges for sundrying in the trials conducted at Cuddalore were Rs. 3-8-0 per 100 bags. The operation involves considerable practical difficulties. In addition to this, the frequent handling of groundnut kernels increases the proportion of splits and broken which is not desirable. Cyanogas and Chlorosal were tried as fumigants at 3 lb. and 7 lb. respectively per 1,000 cubic feet of space. It was found that the insect found on the surface of the sand flooring was killed but those which were 3 to 4 inches inside were not affected in both cases. Apart from this consideration, the existing groundnut godowns at Cuddalore and Madras are not so constructed as to be made air tight for fumigation purposes. So this measure cannot be recommended for general adoption. There is the general practice of keeping a permanent layer of sand on the floor of the godown at Cuddalore. Examination of the different godowns during the year has shown that the sand retains the kernels scattered during the handling operations and a permanent source of infestation within the godowns. Keeping a permanent layer of sand should therefore be discouraged. If a layer of sand is to be kept, it is desirable that it is periodically removed and fresh sand brought in to prevent breeding of the pests. Trials were conducted at Coimbatore to test the efficacy of super heating of godowns. A room of 1,500 cubic feet capacity and four charcoal furnaces each holding an average of 14 pounds charcoal were used for the experiment. The maximum temperature recorded was 138 F. *Necrobia* and *Tribolium* used as test insects were not markedly affected. This method was not effective and it also involves considerable risk of fire and also practical difficulties in the operations. Examinations made during the year showed that there was very little of insect damage to groundnut when stored in the form of pods. Ryots generally keep their seed material in the form of pods for

about 8 months but the surplus stock is disposed of in the markets as kernels soon after harvest. If there is reduction of interval between decortication and storage, the insect trouble can be minimized greatly but the problem of transport and limitations of space in the godowns are arguments against pod storage. Preliminary trials with D.D.T. have given hopeful results. Groundnut kernels were mixed with different doses of D.D.T. and kept for *natural infection* and examined after 11 weeks. It was found that 2 per cent and 5 per cent D.D.T. lots had no live insects and no loss in weight while the control had a number of live insects and 20.7 per cent loss. When mixed with kernels and *insects introduced* 4 per cent and 10 per cent D.D.T. gave cent per cent death of *Necrobia* in 3 days. Small bags filled with kernels were dusted on the outside with different doses of D.D.T. and known number of insects introduced outside the bags. This treatment also gave encouraging results and there was cent per cent kill of *Necrobia* in 3 days for 2 per cent D.D.T.

VI. STUDIES ON INSECTICIDES.

Considerable progress was made in the study of D.D.T. and 666 insecticides. Of the different strengths tried, viz., 5 per cent, 2 per cent, 0.1 per cent and .006 per cent, only the first two had lethal effect on *Argyria* caterpillar, a pest of sugarcane. A 10 per cent D.D.T. dust gave good results against the lablab bug—*Captosoma cribraria*. Bamboo treated with D.D.T. dust and D.D.T. in kerosene gave good results against termites, *Microtermes* sp. The treated bits were buried in the soil and examined periodically. At the end of 3 months, the controls were completely eaten up while the treated ones were not affected. A 5 per cent D.D.T. dust was very effective against black ant—*Camponotus compressus*. Dusting of 1 per cent D.D.T. and 666 gave cent per cent kill of *Lepisma* in 24 hours. The good effect of a 5 per cent D.D.T. reported by previous workers against bed bugs, flies, mosquitoes, roaches and head lice was confirmed. The cane borer egg parasite—*Trichogramma minutum*—was exposed to 2 per cent D.D.T. and 666 for a minute. In the latter case all the parasites died while in the former a few (1 per cent) recovered. Both the chemicals were found to have repellent properties since eggcards of *Corecya* dusted with these were not parasitised. A 0 per cent D.D.T. and 666 in honey acted as a stomach poison when fed to the honey bee—*Apis indica*—and of the two the first gave higher percentage of mortality. When dusted inside the hive, 666 was a more effective contact poison than D.D.T.; the former killed the entire bee-population in the course of 10 hours while the latter killed only 10 per cent.

Other insecticides tried consisted of Pyrethrum Thevetia and Lobelia. Four species of Pyrethrum received from the Cotton Specialist were tried against aphids and tingitids to note their comparative effect. Kerosene extract of Pyrethrum at a strength of 1

in 10 of water plus soap was effective against *Phenococcus* and *Pulvinaria* scales on redgram. Thevetia oil emulsion at a strength of one ounce in one gallon of water gave cent per cent, 76 per cent and 35 per cent kill against small, medium and grown-up caterpillars of *Achava janata*. Lobelia decoction with addition of soap gave good results against the brinjal Tingitid, snake gourd aphid and Bhendai mites. Against the castor mite it was as good as dusting with flowers of sulphur.

VII. LIFE HISTORY STUDIES AND PEST CONTROL AT HEADQUARTERS.

The more important of the insects whose life history and habits were studied are given below :—

(1) The Carabid predator *Paranal laticincta* of the coconut caterpillar—*Nephantis serinopa*, (2) *Glitina scitaria* and *Pericyma glancinas* on daincha, (3) egg parasite of the paddy stem-borer, (4) an Ichneumonid parasite on *Melanitis ismeme*, (5) *Opius fletcheri*—parasite of fruit flies, (6) Pteromalid parasite of *Epilachna*, (7) *Elasmus* sp. on *Chapra mathias*, (8) *Scymnus* sp. on *Pseudococcus virgatus* on custard apple, (9) a predatory moth—*Eublemma amabilis* on lac on fig and (10) parasites and predators of the cotton aphid. Control of pests in and around the Central Farm were carried on as usual. The chief insects that were dealt with during the year were : *Epilachna* beetles on bitter gourds and brinjals; on cowpea, bhendi, cluster bean and black and green grams; hairy caterpillar on ber, fig and moringa; aphid on ragi, lablab, horse bean, oranges, cabbage, bhindi, chillies and cotton; scales and mealy bugs on ragi, croton, rose, coconut, neem and Derris; *Plusia* on gourds; *Parasa* on mango; fruit flies on gourds; beetles on pumpkin; leaf roller on cotton; *Nephantis* on coconuts; thrips on paddy, ragi and chillies; mites on castor; *Coptosoma* on lablab as well as field rats.

VIII. BEE-KEEPING.

Apiary.—The Apiary attached to the Institute had on an average 40 colonies. From July to September the weather was windy; the pasturage during the time was Acacia, plantain, drumstick and a few vegetable flowers. From October to December, cholam, cumbu, maize and a few weeds yielded pollen in abundance. From January to February, there was good collection of nectary and pollen from cotton and garden flowers. Comb construction was very brisk and a maximum of 52 lb. of honey was got in February. The record for individual hive was 14 lb. 8 oz. The period—March to June—was hot and droughty; there was not much of nectar secretion from Margosa, Albizzia, *Peltophorum* and other avenue trees and the condition of the colonies was not quite satisfactory. A total of 126 lb. of honey was extracted from 25 colonies.

2. *Research*.—Research on various aspects of bee-keeping was continued and showed progress. Studies on the yellow banded bee hunter—*Vespa cincta*—were continued. A nest killed by the application of the fumigant—Calcium cyanide—showed 356 individuals in all out of which 335 were males. The utility of the swarm prevention trap was tested during the year. It was found that this contrivance was as good as dequeening and demaree methods and more useful in the case of out-apiaries where it is not possible always to watch the issue of swarms. During the year, three plants were noted for the first time as bee-pasturage: *Cleome viscoso*—(Pollen), *Oryza sativa*—(Pollen), *Bauhinia Hookeri*—(Pollen).

Longevity studies.—The maximum longevity for a worker was found to be sixty days. For noting the effective longevity of workers, these were marked and examined at different intervals. One set of trials was started on 8th November 1944 and the other on 6th January 1945. Over 40 per cent of the workers were found alive till the 40th day after which mortality was rapid. During the course of the above observations, it was found that some workers, three days old, also participated in a swarm. In June, 20,000 workers were marked for flight range studies. The maximum distance travelled by bees for forage was 6 furlongs. Out of the four colonies selected, one lost its queen; the three remaining colonies are being studied for the honey yield and other desirable traits.

3. *Propaganda*.—There were 10,173 hives working in this Presidency during the year under review. As a result of the intensive propaganda done by the Entomological Section and the District staff, bee-keeping is gaining popularity. The annual Honey week organized by the Entomological Section was celebrated in June 1945 at Coimbatore; it was inaugurated by Rao Bahadur C. Satyanarayana Chowdari, B.A., B.L., District Judge. There was a Bee exhibition in connexion with the celebrations. Training in bee-keeping was imparted to 43 students of the Government Training School, Coimbatore, and also to several batches of sepoys sent by the military. The bee-keeping assistant visited different rural recreation centres and gave talks on the subject. Exhibits were sent to the different exhibitions. Foundation combs were supplied to the public. Practical hints on bee-keeping were published every month in the departmental journal in Tamil and Telugu.

IX. FUMIGATION.

Fumigation work was very heavy during the year. Fifteen thousand mica cases of the Bombay Co., Ltd., were fumigated at Madras with "Cymag" against the Bostrychid borer—*Heterobostrychus* sp. One thousand eight hundred and sixteen bags of cholam were fumigated for the Superintendent, Malt Factory, Coimbatore. One hundred and seventy-five bags of wheat and 583

bags of barley in the government godowns at Coimbatore were fumigated. In addition to these, several samples of seeds were fumigated for heads of sections and pest free certificates issued. One hundred and twenty-one packages were fumigated as an anti-plague measure. Plant quarantine work at the ports of Nagapattinam, Madras, Tuticorin and Dhanushkodi continued to be under my charge.

X. SYSTEMATIC STUDIES AND COLLECTIONS.

As in the previous year, due to the pressure of economic work, much time could not be devoted for systematic studies. Studies on parasitic Hymenoptera were, however, continued. Insects collected during the year were preserved for sending abroad for identification after the war. One consignment of insects was received back identified by the Imperial Entomologist and another by the Imperial Institute of Entomology, London. Appointment of an Assistant Entomologist for systematic studies and to be in charge of our valuable collections will be welcome.

XI. PROPAGANDA AND CAMPAIGN.

The chief items of work of the Entomology-cum-Mycology staff in the districts were demonstration of remedial measures against pests of crops and stored produce and popularization of bee-keeping as a cottage industry. Pest Act operations were also in their charge. The important pests noted in the districts during the year are mentioned in the detailed report.

XII. SCIENTIFIC PAPERS PREPARED.

The following papers were prepared during the year:—(1) Insect pests of vegetables and their control, (2) Bee-keeping as a cottage industry and 'Hints for bee-keepers' for different months, (3) Pests of citrus and their control, (4) *Thevetia neriiifolia*—a potent insecticide, (5) Sweet flag—a source of vegetable insecticide, (6) Insect pests of stored grains and their control and (7) The stem-borer and mealy bug of paddy and their control.

XIII. ARTISTS' SECTION.

The following items of work were done by the artists during the year:—110 photographs, 505 photo prints, 33 enlargements, 311 labels, 28 posters, 84 maps, 8 charts, 36 graphs, 7 class diagrams, 194 pen and ink drawings, 38 pencil sketches, 16 paintings, and 64 lantern slides.

XIV. PRESERVATION OF FOODGRAINS (CIVIL SUPPLIES).

The Assistant Entomologists at Bezwada, Madras, Coimbatore and Tiruchirappalli, appointed for the preservation of foodgrains, worked under my technical guidance. A meeting of the Assistant Entomologist was held at Madras for the purpose of evolving

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a uniform method of procedure to be adopted by them. Fumigation of infested grains, advice for the proper storage and priority of disposal of grains were the main items of work of the staff. As a result of the work of the staff, considerable quantities of food-grains—especially wheat—were saved from destruction.

XV. MISCELLANEOUS.

I attended a conference of Entomologists in July 1944 and a meeting of the Plant Entomology Committee in February 1945 convened by the Imperial Council of Agricultural Research at New Delhi. I was Internal Examiner in Agricultural Zoology for the B.Sc. (Ag.) degree of the Madras University and in Entomology for the B.Sc. (Agri.) degree examination of the Nagpur University. Mr. Shumsher Singh from the Department of Agriculture, Burma, continued to have his training till 7th September 1944.

COIMBATORE,
6th August 1945.

M. C. CHERIAN,
Government Entomologist.

ADMINISTRATION REPORT OF THE GOVERNMENT
MYCOLOGIST FOR THE YEAR 1944-45.

Charge.—I was in charge of the office throughout the year under report.

2. *Staff.*—There were many changes in the staff during the period. Sri T. S. Ramakrishnan, who was the Assistant Mycologist, Ergot Scheme, was transferred to the new post of the Gazetted Assistant to the Mycologist, Coimbatore. He took charge on the forenoon of 3rd August 1944. Sri K. Krishna Menon continued to officiate at Assistant Mycologist, scheme for the survey of Pollu disease of pepper, till 15th December 1944 when he was transferred as Assistant Mycologist, Ergot Scheme, Ootacamund. Sri P. Govinda Rao was temporarily posted as Assistant Mycologist, Ergot Scheme, from 2nd August to 19th December 1944. He was re-posted to Guntur as Assistant in Mycology, Tobacco Schemes, on the termination of his appointment as Assistant Mycologist.

Miss C. K. Soumini and Sri V. Ramalingam were appointed as assistants in Mycology on probation from 8th December 1944. Sri C. L. Subrahmanyam joined duty as an assistant on 2nd January 1945. Sri T. V. Subba Rao reported for duty as assistant on 15th January 1945. Consequent on his selection as a probationary Assistant Conservator of Forests, he resigned his appointment as assistant in this section and was relieved on 27th March 1945. Mr. T. S. Francis, another probationary assistant, was appointed as probationary District Agricultural Officer, and was relieved on 19th April 1945. Sri I. L. Narasimhalu, officiating assistant in Mycology, was appointed as Junior Assistant, Wheat Rust Scheme, from 15th November 1944 to 28th February 1945. On reversion to the section he was appointed as Assistant in Mycology, Cardamom Research Scheme, Singampatti, from 1st March 1945. Sri C. S. Rajaratnam, who was in the section as Assistant Agricultural Demonstrator in Mycology, was posted for district work in September 1944. Sri K. Narayana Rao, fieldman, was deputed as Junior Assistant, Wheat Rust Scheme, Bombay, from 7th November 1944 to 14th March 1945. He was promoted as Assistant in Mycology for the Araku Valley Scheme and was relieved from this section on 31st May 1945. Sri S. M. Tiraviyam, officiating clerk, resigned on 17th October 1944. In his place, Sri C. K. Sundaresan has been appointed as an emergency candidate.

The scheme for scientific aid to cardamom industry in South India commenced work from 1st October 1944 with the appointment of Mr. P. Abraham as the Assistant Botanist (Cardamom Specialist), Singampatti. Sri K. P. Anantanarayana Ayyar was appointed as the Assistant Entomologist in charge of the entomological work in the scheme from 19th October 1944 at Valparai. On 16th

November 1944 forenoon he was reverted to his original post and Sri E. R. Gopala Menon was posted as Assistant Entomologist, Valparai. Sri John S. Gurubatham has been appointed as a fieldman at Singampatti and Mr. F. W. D. Hutton as fieldman at Valparai. Sri C. V. Pasupati was appointed as clerk in the scheme.

Sri C. R. Natarajan, fieldman in the scheme for the investigation of blast and foot-rot diseases of rice in Madras, resigned his appointment. Sri D. Narayanaswamy has been appointed in his place.

3. The work of the section is classified under the following heads :—

- (1) Research on diseases of food-crops.
- (2) Research on diseases of industrial crops.
- (3) War efforts and agro-industrial research.
- (4) Scheme for scientific aid to cardamom industry in South India.

- (5) Quarantine services and legislative measures.
- (6) Survey of pollu disease and wilt disease of pepper.
- (7) Propaganda.
- (8) Teaching.
- (9) Advisory work.
- (10) Microtomy.
- (11) Grow more food.
- (12) Miscellaneous.

I. RESEARCH ON DISEASES OF FOOD-CROPS.

Rice—'Blast' disease—Piricularia oryzae.

Varietal resistance trials.—In continuance of the experiments conducted during the previous year, 128 cultures of rice comprising those that exhibited less than 15 per cent infection in the previous season and others obtained from outside the Province and three wild varieties were tested to observe their relative resistance to blast. The trials were in two series. In the first, the sowings were carried out at the same time while in the second, the sowings were so adjusted that flowering occurred more or less at the same time. Thirty-eight cultures in all exhibited less than 10 per cent incidence of 'blast' while the control had 36.5 to 48.2 per cent of infection.

Manurial experiments.—The influence of the application of graded doses of nitrogenous manures on the incidence of blast was investigated by pot and field experiments. Ammonium sulphate at the rate of one, two and three hundredweights per acre, and groundnut cake at three, six and nine hundredweights per acre were applied besides a normal basal dressing of farm-yard manure. Two cultures of paddy, viz., Adt. 10 and Co. 4 representing extreme susceptibility and resistance to 'blast' were grown in these. The incidence of the disease on the former were higher with the increase in the dosage of nitrogen. In the case of Co. 4, however, there was no difference between the treatments.

(a) *Foot-rot* (*Fusarium moniliforme* var. *majus*).—Fifty-seven cultures of rice including thirty-two from other Provinces were tried to evaluate their relative susceptibility to foot-rot. Thirty-four cultures exhibited less than 10 per cent incidence of foot-rot.

(b) *Fungicidal trials—Field experiments.*—The relative efficacy of six fungicides, viz., Agrosan G, copper carbonate, fine sulphur, Baluchistan sulphur, formalin-charcoal dust and harvesan, in controlling foot-rot was tested. Agrosan G was found to be the best of the lot.

(c) *Effect of feeding poultry with grains treated with mercurial dusts.*—Grains dressed with cersan were fed to the poultry to observe whether any harmful effects are experienced if treated seeds are used for feeding. The birds under treatment did not appear to suffer any harmful effect even when 4 grams of the organo-mercury compound were used to treat one pound of seed, i.e., four times the normal rate and the grain freely fed to poultry.

Effect of seed treatment on germination of grains.—No deleterious effect was produced by cersan or Agrosan G on the germination of rice grains when the normal dosage is employed. But when the dosage is increased to three or four times the normal, germination is retarded though the percentage is not reduced.

Helminthosporiose—Seed treatment.—The efficacy of seed treatment with Agrosan G, copper carbonate, fine sulphur, Baluchistan sulphur and formalin-charcoal dust for the control of Helminthosporiose was tested. The incidence of disease was negligible in all the plots including the control.

Ephelis oryzae.—Field experiments were conducted at Kollegal to observe the effect of seed treatment with Agrosan G and sulphur and spraying Bordeaux mixture on the crop prior to flowering on the incidence of the disease. The incidence of the disease was low in all the plots without any significant difference among them.

Ragi-blast (*Piricularia* sp.)—Twenty-one cultures of ragi were tested to note their relative resistance. All were found to be susceptible, the range of incidence being 33.9 per cent (E. C. 155) to 75.6 per cent (E.C. 1540). The previous observation that the July planted crop is the least affected was again confirmed this year.

Sorghum-smut (*Sphacelotheca sorghi*) *Control experiments.*—Field experiments were conducted at Coimbatore, Kollegal, Ongole, Nandyal and Guntur to evaluate the relative efficacy of seed dressing with sulphur as compared with the Burma method (soaking seeds in water and drying in the sun) and Prof. Luthra's modified method (drying the soaked seeds in shade) in controlling smut. In all the areas it was found that sulphur uniformly proved to be superior to the other two methods. It was, however, observed that these two methods were superior to the control, but the trouble, time and labour involved was not commensurate with the benefit except when sulphur is completely unavailable.

The comparative efficacy of seed dressing with five fungicides, viz., Agrosan G, copper carbonate, formalin-charcoal dust, fine sulphur and Baluchistan sulphur for the control of smut on sorghum was tested by field experiments at Coimbatore and Ongole. All excepting formalin-charcoal dust proved to be efficient in controlling smut. This experiment forms part of a series of co-ordinated seed dressing trials of the Imperial Council of Agricultural Research.

Tenai rust (*Uromyces setariae-italicæ*).—An unusually heavy outbreak of this disease in Kurnool occurred during the year. The cultivation of disease resistant strains being the only method of controlling this disease, field observations were made in collaboration with the Millets Specialist to assess the relative resistance of the available cultures of this millet at the Millets Breeding Station. All the strains were susceptible, the crop infection being 100 per cent.

Wheat rusts.—The suspension of wheat cultivation on the Nilgiris and Palnis between April and September was enforced in 1944 also. This year the Travancore Government also prohibited wheat cultivation during the same period in Devikolam taluk of Travancore State adjoining Kodaikanal taluk. The scheme has been terminated as from 31st March 1945. The second (cold weather) crop of wheat and barley on the hills and plains was examined to estimate the incidence of rusts. Yellow rust occurred on the hills only. Black rust occurred earlier in the plains than on the hills while brown rust appeared earlier on the hills.

Orange 'Mottle leaf'.—It has been found that the beneficial effects of zinc sulphate spray for the control of 'mottle leaf' are not permanent. To find out the frequency of spray treatment necessary to produce permanent control, experiments were started at Panyam and Kodur. One, two and three sprays per year with or without manurial applications are being tried. In Yercaud the disease does not respond to zinc sulphate spray. Spraying and soil application of different substances besides zinc sulphate are being tried.

Potato—Virus diseases.—Surveys of the potato crop on the Nilgiris in March and again in June showed the wide prevalence of a number of virus diseases. Harvest experiments of diseased and apparently healthy plants showed the great reduction in yield caused by virus diseases.

Quality of potatoes.—Preliminary experiments to note the effect of the application of different trace elements to the soil to improve the yield of potatoes at Kotagiri have not given any indication of the necessity for the application of those ingredients.

II. DISEASES OF INDUSTRIAL CROPS.

Cotton—'Blackarm'.—The seed dressing experiments conducted during the year again showed that secondary infection is not controlled by this treatment. The incidence of the disease was,

however, negligible in the experimental area. The selections and cultures at the Cotton Breeding Station were examined to assess the relative incidence of the disease. Artificial infection of 'wild' types is being made to note their reaction to the disease.

Tobacco broom rape (*Orobanche cernua*) *Control*.—Attention was concentrated on devising methods of control of this parasite.

(i) *The use of sunflower material incorporated into the soil*.—The residual effects of the application of organic material to the soil from sunflower grown *in situ*, brought from outside, and material from Pillipesara (*Phaseolus trilobus*) applied last year on the incidence of orobanche was tested by planting the same plots with tobacco this year also. The results were not significant there being no difference between the plots either in the emergence of broom rape shoots or in the yield of green leaves of tobacco.

(ii) *Residual effect of organic material of solanaceous crops on orobanche incidence*.—Tobacco was again planted in the plots to which organic material from solanaceous crops had been added during the previous year, to observe the residual effects of this treatment on the incidence of orobanche. It was found that none of the treatments was superior to control. On the other hand more broom rape shoots were observed in some of the treatments.

(iii) *Utilization of Datura fastuosa var. alba as a trap crop for the control of orobanche*.—It has been observed that *Datura fastuosa* stimulates the germination of orobanche seeds. A number of experiments were conducted to find out whether this plant can be utilized to reduce the incidence of orobanche. The treatments consisted of (a) growing *Datura* in the punasa season and planting tobacco in the same plots in the pyru season, (b) Growing *Datura* early in the punasa season and ploughing in the plants prior to planting tobacco, or removing the *Datura* plants prior to planting tobacco, (c) drill sowing of *Datura* seeds between rows of tobacco plants or planting seedlings of *Datura* between rows of tobacco. Reviewing the results of these experiments it was found that when *Datura* is grown as a trap crop the incidence of orobanche on the succeeding tobacco was reduced only in one out of the three experiments. Further experiments will be conducted to observe the effects. When *Datura* is grown as an inter crop there is no significant reduction in the incidence of orobanche but the yield of green leaf of tobacco is definitely reduced.

(iv) *Methods of growing Datura fastuosa in the field*.—One of the difficulties encountered in raising this plant was lack of good germination under field conditions and consequent poor stand. Several methods were tried to find out the optimum seed rate, depth of sowing, pretreatment of seed and nature of the soil for obtaining the maximum number of seedlings. It was found in all these trials that the germination of *Datura* seeds was poor and slow ranging from 0.3 to 9.6 per cent under field conditions. The higher figure is reached when rainfall occurs immediately before and after sowing

and the seeds are lightly covered with a junior hoe. Broadcasting was found to be superior to other methods of sowing. Sowing at a depth of 3/4th inch gave the highest percentage. However raising *Datura* in nursery beds where greater attention can be devoted and transplanting the seedlings in the field appears to be the most satisfactory method. Forty per cent germination occurs under nursery conditions.

(v) *Chemical versus mechanical methods of eradicating orobanche.*—Besides handpicking of orobanche shoots at definite intervals, the effect of the application of solutions of copper sulphate, ferrous sulphate, atlacide and Agri-tree killer solution of different concentrations on the eradication of orobanche shoots was tested. There was no difference between the treatments either as regards the incidence of orobanche or yield of green leaves of tobacco. Agri-tree killer solution of 1:8 and 1:6 strengths killed the shoots of orobanche in 48 hours without affecting the tobacco plants. The others were slow in their action and sometimes seed setting had completed before the orobanche shoots withered.

(vi) *Effect of the previous crop on the incidence of orobanche.*—This is the second year of the experiment. During this season no significant difference was observed between the treatments either in the incidence of broom rapes or in leaf yield.

(vii) *Varietal resistance trials.*—The relative incidence of orobanche was recorded on 21 varieties of tobacco with Harrison's special as control. Four varieties—Havana, Karravithanam, Country rattail and Manilla were significantly superior to the control in respect of orobanche incidence and leaf yield.

(viii) *Fundamental studies.*—Orobanchae seeds were found viable even after two and a half years. The seeds exposed to a temperature of 90° C. for one hour were capable of germination. Three more hosts of orobanche were recorded, viz., *Nicotiana sandarsae*, *Withania somnifera* and *Euphorbia prostrata*.

(G) Tobacco 'Damping off' in nurseries.

Experiments on the control of the disease.—Field experiments were carried out this year also both in the black soil and sandy soil areas. The relative efficacy of raised beds instead of the normal type, heat sterilization of the surface soil of the beds and no sterilization, and the use of fungicides like Bordeaux mixture, Burgundy mixture and colloidal copper of two strengths, and different dosages applied at varying intervals was assessed. The incidence of the disease was heavy in three out of four trials. The following conclusions are drawn from an analysis of the results.

(1) There is no significant advantage in raising the level of the beds.

(2) Sterilization of the soil is significantly superior to no sterilization even at 1 per cent level.

(3) Bordeaux mixture 1 per cent and Burgundy mixture 1 per cent are on a par and significantly superior to the colloidal copper.

(4) All the fungicides at 1 per cent strength are superior to the control.

(5) One per cent strength of fungicide is superior to half per cent strength.

(6) The application of the fungicides at intervals of three days is superior to spraying once a week or fortnight.

(7) There is no significant difference between the application of 500, 750 or 1,000 gallons of the fluid per acre. Hence 500 gallons will be more economical to use.

Economics of treatment.—The economics of the different treatments were worked out. It was found that when Bordeaux or Burgundy mixture at 1 per cent strength are used once in three days a profit of Rs. 2,000 to Rs. 2,200 can be realized per acre by the sale of the seedlings. If on the other hand the treatments are not adopted, the complete loss of seedlings may result.

Seed rate in relation to 'damping off'.—Different seed rates varying from half a tola to one and a half tolas per cent were used to observe the relationship between seed rate and 'damping off'. It was observed that all the beds suffered heavily during seasons of heavy incidence of disease and no difference was noticed between the treatments.

Tobacco Mosaic disease.—Specimens of diseased plants from Visakhapatnam, Godavari and Krishna districts were utilized for inoculation experiments on the differential hosts, *Datura fastuosa* and *Nicotiana glutinosa* and it was found that the virus responsible for this disease in these localities is also *Nicotiana Virus No. 1* of Smith's classification.

Sugarcane mosaic—Varietal resistance trials.—Twelve varieties of sugarcane were under trial for assessing their relative susceptibility to mosaic. The incidence of mosaic varied from ten per cent to sixty-six per cent. The variety Co. 601 remained free throughout while Co. 607 exhibited 10 per cent infection.

III. WAR EFFORTS AND AGRO INDUSTRIES.

Ergot of rye—Large scale production of ergot.

In pursuance of the scheme for the large scale production of ergot on the Nilgiris, rye was grown on 60.8 acres of subvention farms and 20 acres at the Agricultural Research Station, Nandyal, in 1944-45. The original culture of the fungus was multiplied in large quantities and used for spray inoculation. The season was not quite favourable and yet a yield of about 960 lb. of dried ergot were obtained. A sum of Rs. 14,560 was realized by the sale of the drug in the crude form.

In 1945, 63½ acres have been sown with rye on the Nilgiris in subvention farms and 15 acres at the Agricultural Research Station, Nanjanad. The Governor of Madras and Lady Hope have evinced a keen interest in the production of this drug and one and a half acres were sown with rye inside the Government house at Ootacamund.

Research—(i) Varietal trials.—Twelve varieties of rye were under trial. The local rye (now known to have been first brought from Italy) and Australian Black winter rye are best suited for ergot production. The Kashmir rye and other varieties are of longer duration, poorer in tillering habits and give a lower yield of ergots.

(ii) *Effect of manures on yield and quality of ergot.*—The influence of different manures like Fish guano, steamed bone meal, groundnut cake and farmyard manure on the yield and quality of ergots was investigated. It was found that there was no significant difference either in the yield or quality of ergots between the treatments.

(iii) *Isolation of strains of ergot with higher alkaloid contents.*—A large number of individual ergots were assayed according to the method developed by Drs. Mukerji and De to determine their alkaloid contents calculated as ergotoxine. Two sclerotia which showed 49 and 55 per cent of alkaloids were used for bringing the fungus into culture. These cultures are being multiplied for use during 1945 for spraying purposes.

(iv) *Natural ergots in South India.*—During the year three more grass hosts were recorded as hosts of the genus *Claviceps*, from Coimbatore, Nilgiris and Pulneys. All these produced sclerotial and sphaelial stages.

Food Yeast.

Research—Influence of pre-treatment of molasses on yield of yeast.—In order to find out whether by the removal of impurities in the molasses, the yield of yeast could be increased, the molasses were clarified and treated with H² SO₄ and steamed for 15 minutes or boiled with superphosphates and then treated with liquor ammonia. Clarification gave a slight increase in yield.

Molasses from factories where sulphitation or carbonation process of manufacture are in vogue were obtained and utilized for the preparation of wort. There was no difference in yield from the two types of molasses.

Variations in the length of fermentation period.—If the supply of molasses is maintained at the same level the yield of yeast is also equal when aeration is carried out for 6, 8 or 16 hours. But if further quantities of molasses are added there is proportionate increase in yield in the duration of aeration. The quantity of air blown in was varied from 1½ c.ft. to 80 c.ft. per minute but the

level of yield of yeast remained stationary. But when the arms of the aerator are enclosed in cloth bags thereby making the air diffuse more uniformly, an increase of ten per cent in yield was obtained indicating that ceramic aerators may prove advantageous in increasing yield.

Effect of height of column of liquid.—Aeration of the same quantity of liquid kept at 3½ feet and 8 feet height by using tanks of different diameter showed that there was no increase in production by the increase in height of column.

Maintenance of pH. at a constant level of 4.8.—This was being effected by the addition of calculated quantities of liquor ammonia at definite intervals. During the year one important step in advance was made by the discovery that a ten per cent solution of ammonium carbonate can be used with advantage instead of liquor ammonia. Further this increased the yield by about 16 per cent and reduced the cost of production as ammonium carbonate is much cheaper than liquor ammonia. A method was devised by which the solution of ammonium carbonate was allowed to drip continuously into the wort at a definite rate to maintain the pH at a constant level.

Phosphate content of wort and yield.—It was found that the quantity of phosphates can be varied from half to double the normal strength without affecting the yield.

Vitamin content of the yeast produced under different conditions.—The assay of the vitamin content of yeast samples done at the Nutrition Research Laboratories, Coonoor, showed a higher Thiamin content in yeasts produced in worts to which ammonium carbonate or steamed malt culms were added than in wort treated with liquor ammonia.

Estimation of alcohol produced by Torulopsis utilis.—With the kind co-operation of the Government Agricultural Chemist the alcohol contents of the wort was determined at intervals throughout the period of fermentation. The alcohol content was low and never exceeded 1–2 per cent.

Trials with Torulopsis utilis var major.—The yield from this strain was only equal to that from the old strain of *T. utilis*. A quantity of 248 lb. 10 oz. of yeast which formed the bye-product of various researches were sold during the year.

IV. SCHEME FOR SCIENTIFIC AID TO CARDAMOM INDUSTRY. IN SOUTH INDIA.

A scheme partially financed by the Imperial Council of Agricultural Research was put into operation on the 1st October 1944. It is worked partly at Singampatti and partly at Valparai. The botanical and mycological aspects of the scheme are investigated at the former place. A collection of seeds of different types have been made and nurseries have been raised for their multiplication. At Valparai, the entomological problems connected with the crop are

under investigation. Collections of the important types of cardamoms in South India have been planted at this station. Field experiments have been started to test the efficacy of various insecticides including D. D. T. and 666 on the control of thrips.

V. SURVEY OF THE POLLU DISEASE AND WILT DISEASE OF PEPPER.

A survey of the important pepper tracts of Malabar, Cochin, Travancore, Mysore, Coorg and Kanara was conducted from June to December 1944 to find out the extent of 'pollu' and wilt diseases of pepper. This year only a slight incidence of the disease was evident in North Malabar. The anthracnose of pepper caused by *Colletotrichum necator* was noticed in all the areas but the damage was slight. The wilt of pepper was present in all the tracts but mortality was very low. Four different fungi have been isolated from the diseased plants. Collections of important varieties of pepper from the different tracts have been planted at the Agricultural Research Station, Taliparamba to form a nucleus for future utilization.

VI. PLANTS QUARANTINE AND LEGISLATIVE MEASURES.

The examination, treatment and certification of plants and specimens intended for export continued during the year.

The Madras Agricultural Pests and Diseases Act continued to be in force in respect of the following diseases in the province:—

- (1) *Budrot of palms*.—East Godavari, West Godavari, Kistna, Guntur and three taluks of Malabar.
- (2) *Broom rape of tobacco*.—Guntur, Kistna, East Godavari, West Godavari, Nellore and Vizagapatam.
- (3) *Sugarcane smut*.—Hospet, Bellary district.
- (4) *Wheat rust*.—Nilgiris, Kodaikanal taluk and Devikulam taluk of Travancore, from April to September 1944 only.
- (5) *Cardamom mosaic*.—Palghat taluk of Malabar.
- (6) *Spike disease of sandal*.—Parts of Salem district.

A special staff of one gazetted officer, one upper subordinate, two clerks, 22 fieldmen and 66 maistris were employed by the department for the enforcement of the control measures for broom rape of tobacco. One Sub-Assistant in Mycology, three Revenue Inspectors and nine maistris were on special duty in Malabar to enforce the Act on budrot of palms. Four maistris were employed to help the Agricultural Demonstrator, Hospet, for the control of sugarcane smut.

VII. PROPAGANDA.

The section participated in several exhibitions and shows. Articles were published in the grow more food journal regarding the important diseases of crops and their control during particular months.

VIII. TEACHING.

Thirty-five lectures and thirty-one practical classes were held for the students of B.Sc., III. Two batches of sepoys were given training in the identification and control of important crop diseases. A batch of military officers was given one lecture followed by a demonstration of the crop diseases, their cause, symptoms and control.

IX. ADVISORY.

Sixty specimens were received for examination. These were reported upon and suitable advice regarding control measures were given.

X. MICROTOME SECTION.

One hundred and fourteen materials were received during the year and 121 embedded. Five hundred and fifty-five slides were prepared and supplied to the different sections.

XI. GROW MORE FOOD.

Sorghum anti-smut campaign.—Utilizing the scheme sanctioned by the Government for the purchase and distribution of sulphur to the ryots for seed dressing of sorghum, 40 tons of sulphur were purchased and in spite of acute transport difficulties, 7484 lb. were distributed to ryots to enable them to sow 166,723 acres through the departmental organization. Arrangements have been made for the early distribution of sulphur to the ryots this season.

Edible mushroom.—Wide publicity was given to the cultivation of this article of food by demonstrations of mushroom growing in Madras and other places. The demand for the spawns has been so heavy that it has not been possible to meet all of them in time. One hundred and seventy-seven bottles of spawn were sold this year.

XII. MISCELLANEOUS.

Agri tree killer solution.—The demand for this solution was on the increase and 18 gallons were sold during the year. There was some difficulty in obtaining one of the ingredients but now it has been overcome.

Distribution of fungal cultures.—Stock cultures of *Volvaria diplasia*, *Claviceps purpurea*, *Phytophthora* spp. and other fungi were distributed to several Provincial Mycologists, Imperial Mycologist and others.

COIMBATORE,
22nd August 1945.

K. M. THOMAS,
Government Mycologist.

ADMINISTRATION REPORT FOR 1944-45 OF THE GOVERNMENT LECTURING AND SYSTEMATIC BOTANIST.

I beg to submit my annual report for 1944-45. This is the fourth report since the section attained independent status in February 1942 and became a unit with teaching as one wing of its activities and herbarium as its other.

2. *Establishment.*—As per G.O. Ms. No. 1070, Development, dated July 1944, a Gazetted Assistant was sanctioned for teaching and Sri K. Cherian Jacob held that post till October 1944 when he went on leave preparatory to retirement and Sri C. Rajasekhara Mudaliar, M.A., was transferred to this section as Gazetted Assistant in Botany. In the vacancy caused by Sri K. Cherian Jacob's promotion to the Gazetted rank Sri T. Gopal Rao, M.Sc., was appointed and he joined service in December 1944 and Sri S. Ramaswami Raju who was due to retire on 12th May 1945 was given an extension of service by the Director of Agriculture for one more year from that date.

3. *Teaching.*—This year is unique in the history of the College in that 92 students were admitted into the first year. The students were divided into two batches, each of 46, for practical work in Botany and the lectures were held for the full number. The revised University syllabus which had undergone changes as recommended by the Board of Studies in Agriculture and approved by the University of Madras passed through its second year. Though Horticulture now finds a place in the syllabus under Agriculture, the responsibility of teaching this subject with its considerably enlarged syllabus spread over the whole of the second year devolved on me. Genetics was also taught by me inasmuch as the post of Geneticist has vanished and the teaching of Cytogenetics and plant breeding has been entrusted to me. Excepting for Mycology which was handled by the Mycologist, I taught during the year under report all aspects of Botany, pure and applied. The Lectures and Practical classes handled by me, the Gazetted Assistant (Sri K. Cherian Jacob for some time and then Sri C. Rajasekhara Mudaliar), Sri S. Krishnamurthi, Sri S. V. Parthasarathy and Daniel Sundararaj are given below:—

	Theory.	Hours.	Practical.	Total.
Class I	54	54	71—110 (total for two batches.)	164
Class II	78	78	44—81	159
Class III	57	57	33—80	137

Classes II and III had six special lectures; four by Sri U. Narasinga Rao, B.Sc. (Ag.) of the Pomological Station, Coonoor, on Hill fruits and vegetables and two by Dr. G. Siddappa, D.Sc.

Bio-Chemist and Superintendent, Malt Factory, on fruit and vegetable preservation in response to my request. The Third year students were taken to all the Breeding Stations including the Imperial Sugarcane Station, for lessons on plant breeding technique.

Teaching in Horticulture was given to Sepoys as they were being sent and my Assistants and I went to Madukarai off and on to deliver lectures in Horticulture to the troops.

Madras University Examinations.—I functioned as an Internal Examiner for First Examination in Botany along with Sri K. M. Thomas, the External Examiner. I was also the Internal Examiner for Horticulture, Second Year Examination along with C. Ramaswami Naidu, Esq., the External Examiner, Sri S. Krishnamurthi was Internal Examiner, for Final Examination Paper I along with Dr. N. Parthasarathi and Sri S. V. Parthasarathy, Internal Examiner for Paper II along with K. M. Thomas, Esq.

4. *Seed testing.*—As many as seed samples were tested and the results communicated to the respective correspondents. Seeds of 50 species of local weeds were collected and studied in regard to their germination capacity. The study is still in progress.

In October 1944, the Director of Agriculture drew my attention to the low germination of Kolingi seeds. A preliminary study of the seed lot from Tanjore district, revealed that these are distinct ecotypes fruit some of them give high percentage of germination. This fact was verified by a tour to those seed producing areas and study of the plants in the field. This work is also in progress.

5. *Herbarium Systematic and Economic Botany.*—(a) *Systematic work.*—Six hundred and ninety-six botanical specimens were identified. Of these 413 were for the Herbarium and the rest for Correspondents chiefly of the Agricultural, Forest, Health, Veterinary, Public Works and Tea Scientific departments; reporters and exporters of drugs, heads of institutions and last not least private individuals. Four hundred and thirty-six botanical specimens were collected for the Herbarium from Tirunelveli, Ramanad, Coimbatore and Nilgiri districts. Of these, 120 were new distributions for the above districts and 17 were collected for the first time for the Herbarium including one species of *Compositae*, *Blumea amplexans* var. *arenaria* Clark which has not been recorded so far to occur in South India. All available cultivated species and varieties of *Sorghum* in the Milllets Breeding Station were collected and prepared for the Herbarium. Seventy valuable specimens from the collection of late Prof. Barnes, the famous botanist, both mounted and unmounted, were presented to the Herbarium by Mrs. Barnes, the wife of the late professor and 27 specimens were distributed on exchange relations. The

authentic identification of six species was made at the Royal Botanic Gardens, Sibpur. Usual repairs of the Herbarium sheets and other routine work connected with the Herbarium were carried out.

(b) *Economic Botany—Intelligence and seed supply.*—Forty-seven correspondents were supplied with information on subjects pertaining to the various aspects of general and economic botany. It is interesting to note that the enquiries were mainly on the Indian drugs and their availability as to be exported to foreign countries. As per orders of the Director of Agriculture, seeds of *Citrullus colocynthis*, a common medicinal plant, were collected and distributed to the different research stations for trial. Planting materials of *Derris elliptica* were received from various sources for trial for their rotenone content and are being raised here. An economic use for *Momordica tuberosa*, Benth has been recorded for the first time. Professor Seshadri of the Biochemical Laboratories, Madras, was supplied with 7 lb. of the dried leaves and 150 grams of the pods of *Mundulea suberosa*, Benth and Mr. B. A. Krukoff, New York Botanical Gardens, New York, with plant samples of six species for their biological studies.

(c) *Fodder grasses and forage plants.*—The study of fodder grasses and seed multiplication for distribution were continued. *Cenchrus ciliaris* has been confirmed to be the best fodder grass under Coimbatore conditions. *Panicum antidotale*, the Australian drought resistant grass, is the most drought resistant of all the grasses tried here. The East Africa grass, *Cynodon Plectostachyum*, Pilger (Giant Star Grass) is another promising one, spreading over large areas in a very short time, fairly drought resistant and giving high yields. Acre yields of 15,000 lb. per cent have been recorded for this grass. Its spreading habit combined with the rooting at the nodes will to a great extent be helpful in checking soil erosion and the officers of Public Works Department have been advised to grow this along tank-bunds and slopy areas and they have been supplied with planting material. A grass survey of the Ayarankal coupe near Pollachi was carried out and suitable grasses for the locality were recommended to the Forest Officers. With reference to a letter from the District Collector of Coimbatore, *Cenchrus ciliaris* was suggested to be extensively grown in the forest panchayats under his control. A pasture grass map for this Province with an explanatory note was prepared and this is expected to be of immense help to the Officers of the Agricultural, Veterinary and Forest Departments engaged in fodder problems.

Suitable forage plants to be tried in pastures and fodder yielding trees are under study.

Thirty-five and a half lb. of the seeds of different important fodder grasses were supplied to 14 correspondents, and 795 lb. of the slips of 'Grant Star Grass' were distributed to the different Public Works Department Officers and the Superintendent, Central

Farm. The Economic Botanist, New Delhi, was supplied with 30 grams of the seeds of *Rhynchosia minima*, a leguminous forage plant, for trial.

6. *Survey of sea weed* (*Gracilaria Tichenoides*).—At the instance of Government the survey was done mainly in Ramnad and Tinnevely districts and also in Vizagapatam. A detailed report on this was submitted on 17th February 1945.

7. *Botanic Garden and Orchard.*—These are maintained mainly for the teaching of Horticulture and advantage is taken to sell all the produce incidentally obtained. Sri S. Krishnamurthi and Sri T. R. Naganatha Ayyar the sub-assistant formed all the staff for not only carrying on the routine work of the Botanic Garden and Orchard and the banana area which are in three different places but to help me in the teaching of Horticulture to the students at the college and also the troops who have been regularly coming in during the year under report. During the year under report an additional mhote was fixed up to the well in the orchard and the well in the Botanic Garden was cleared of its silt and deepened. In spite of the additional mhote as the water-supply of the well in the orchard is not abundant, the advantage gained is not appreciable. It is hoped that with the rains this year the supply in the Botanic Garden well will be augmented.

There was a rainfall of 32.22 inches as compared to 23.8 inches of last year and conditions were fairly helpful for all operations during the year. A permanent hedge of *Gliricidia* was formed in all places possible with a double object, namely, (1) to prevent trespass and (2) to meet the growing demand for this from the public.

Fruits.—To afford facilities for students to study all varieties of fruits, 24 varieties of mangoes and six of grapevine were planted this year. The average yield of the five bearing trees of mangoes of five varieties, namely, mulgoa, bangalora, amini, peter and banganapalle worked out for the last four years shows that Banganapalle has been steady yielder and Amini the best while the others are disappointing.

(Average yield per tree.)

	1941-42.	1942-43.	1943-44.	1944-45.
Mulgoa	32	13	30	66
Bangalora	320	13	Nil.	Nil.
Amini	280	48	166	222
Peter	98	Nil.	15	Nil.
Banganapalle	101	63	92	72

Papayas.—Performances of individual trees are being maintained and it is too soon to make any statement. Eleven thousand three hundred and sixteen lb. of papaya fruits were sold and seeds sold to people who asked for them.

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Sapotas.—Sapotas have been bearing fairly satisfactorily all through the year excepting in the months of December and June.

Citrus.—In spite of the tree being healthy, fruit set has been disappointing and it has been noticed only in grape fruit. Pomello gave in all 120 as compared to 419 of last year.

Banana.—Banana has been very successful. Nine hundred and forty-two suckers distributed and 12,856 lb. of fruits sold.

The following fruits were sold :—

	P.B.		L.B.
Ash gourd	2,026	Radish	353½
Pumpkin	1,878	Ribbed gourd ..	299
Brinjal	2,854	Goa bean	189
Cluster bean ..	2,309	Bread fruit ..	137½
Cowpea	1,137	Jack bean	128
Amaranth	880	Cabbage	84
Drumstick	827	Bottle gourd ..	89
Tapioca	756	Beetroot	38
Bendi	663	Snake gourd ..	38
Tomato	593		

Insect pests and diseases.—Fruit fly and Jassids were giving trouble and I must thank the Entomologist for giving me all help in time.

Plot for wild allies.—A separate plot has been set apart for growing wild allies of cultivated plants so that it may be useful to students and research workers.

Exhibitions.—Fruit and vegetables were sent to the exhibitions at Vizianagram, Trichinopoly and Madras. Our exhibits of papaya, sapota and bananas were very much appreciated.

Sales.		Receipts by sale and adjustments.
		RS. A. P.
1941-42 .. ..	.. ..	623 2 4
1942-43 .. ..	.. ..	1,784 6 5
1943-44 .. ..	.. ..	2,810 15 2
1944-45 .. ..	.. ..	3,771 3 10

8. *Tours*.—I toured in Ramnad, Tinnevely, and Vizagapatam for the survey of the sea weed; in Kurnool for inspecting rubber work and in Tanjore and Trichinopoly for koringi studies. The systematic assistants were sent to Ramnad and Tinnevely for systematic collections. The Horticultural Assistant was sent to all flower and fruit shows.

9. *Miscellaneous*.—Sri C. Rajasekhara Mudaliyar is carrying on his Cytotaxonomical studies in *Cucurbitaceae* and Sri Gopala Rao has started sowing for fuel studies. Sri K. S. Venkataramani was afforded all facilities for research work and he got his M.Sc.

10. *Publications*.—As joint author with Sri S. V. Parthasarathi I prepared two research papers for the Indian Science Congress of 1945. Seven articles from this section were published in "Mezichelvam," two by me, two by Sri C. Rajasekhara Mudaliyar and myself and three by Sri S. V. Parthasarathi and myself.

11. *Visitors*.—M. S. Sivaraman, Esq., I.C.S., R. M. Sundaram, Esq., I.C.S., Dr. Lal Singh, Fruit Development Advisor to the Government of India, and Captain Reeds, I.A.M.C., and attached to the Royal Horticultural Gardens at England were the prominent visitors of the year. Many evinced great interest in the works done on fodder grasses and bananas. Pupils from various educational institutions from and outside the Province, ryots and mirasdars and tourists visited the Herbarium and the grass plots at different times of the year.

COIMBATORE,
30th July 1945.

S. N. CHANDRASEKHARA AYYAR,
Government Lecturing Botanist

ADMINISTRATION REPORT OF THE BIOCHEMIST,
FRUIT CANNING AND PRESERVATION WORK,
MADRAS, FOR THE YEAR 1944-45 (1ST JULY 1944 TO
30TH JUNE 1945).

I submit, herewith, my administration report for the year 1944-45.

2. *Staff.*—From September 4, 1944, I was placed in full additional charge of the Government Malt Factory at Coimbatore. I remained in charge of Fruit Canning and Preservation Work throughout the year. The Imperial Council of Agricultural Research Scheme for the institution of quality grading standards for South Indian Citrus fruits was transferred to the Provincial Marketing Officer to try out on commercial scale the quality standards evolved during the year when the scheme was under my control and supervision. There were several changes in the ministerial staff due to the appointment of emergency candidates.

3. *Introduction.*—Methods for the preparation of a large number of useful products from South Indian fruit have been described in the report for the previous year. In the present report the work done and the results achieved are, therefore, briefly described without detailed reference to the methods developed. The work done is dealt with under separate main headings. Most of the work was carried out with limited equipment already available at the Fruit Products Research Laboratory, Kodur. In spite of the best of efforts it was not possible to get in time all the machinery and equipment ordered in England and in America. A few things like retort and steam jacketted stainless steel and copper pans were received during the year. The G.C. canning unit with a capacity of about 2,000 A. 2½ size cans of fruit per day was ordered in England. It is expected to arrive in the near future. Orders for the Citrus Juice unit and Auxiliary equipment are still under negotiation due to the International situation, but it is expected that they also will become available soon. The Fruit Product Research Laboratory is not yet built. This is necessary to house the large scale units.

4. *Canning.*—Due to the non-availability of cans, canning of fruits was not taken up. Observations on canned products in store were continued. Cut-out tests during the year showed that pineapples of the Kew variety, white guavas and mangoes especially of the neelum and baneshan varieties, had kept well even after nearly 18 months storage at ordinary temperature. Hydrogen swell formation was, however, noticed in some of the samples of canned mangoes. The cans used were lacquered ones. The lacquer had come off in a few places and hydrogen produced due to chemical action on the exposed plate. The swell formation in lacquered cans is due to the fact that lacquering leaves uncovered

some minute portions of the plate where corrosive action is intensified. Even in cans showing signs of hydrogen swell formation, the syrup was clear and the fruit was in good condition.

Although 55 degrees Brix syrup is used for canning fruit of the fancy grade, this high strength of syrup appears to make canned mangoes rather too sweet. A syrup of 40 to 45 degrees Brix is more suited for the canning of mangoes. Processing in boiling water for 30 minutes should be adopted as a standard. When processed at higher temperatures using 5 lb. pressure in an autoclave, the fruit slices inside the can become very soft and pulpy. Even shorter times of processing, such as 15 minutes, lead to the same effect. As a standard process, cooking at atmospheric pressure in boiling water in an open tank is quite suited. Canned mangoes packed in syrup acidified with lime juice tasted slightly acid.

5. *Juices and squashes.*—The work during the year on this subject was confined to the production of lime squash, lemon squash, orange squash, lime juice cordial, mango squash and cashew apple syrup according to the methods already standardized in the Research Laboratory. These were released for sale on a fairly large scale throughout the Province to popularize the products and investigate the possibility of developing the fruit preservation industry in some of the fruit growing areas of the Province. The reaction of the public was very favourable and highly encouraging. Due to lack of any suitable storage accommodation at Kodur it was not found possible to prepare some of these products on a large scale, although there was considerable demand for them. The products have, therefore, to be prepared and disposed of in small lots only. It is, however, hoped that it will be possible to take up large scale production soon after the Fruit Products Research Laboratory is built and equipped with machinery and equipment. Meanwhile, important data for commercial production have been collected.

6. *Lime squash.*—During the year 995 bottles of 22 to 24 oz. capacity of lime squash were prepared in 24 experiments. These included squashes of high, medium and low sugar, i.e., 60, 55 and 45 degrees Brix. The consensus of opinion was that 55 degrees squash was the best as regards taste and flavour. In some of the North Indian Factories, squash of low sugar is packed and distributed. Under South Indian conditions, low sugar squash is not liked much as it has been found to be too acid in taste. For the preparation of low sugar squash, considerably less sugar is required, and this is advantageous in reducing the cost of production.

The following recipe was recommended to the public. A large number of people were much interested in this:—

	LB.
Lime juice	10
Water	10
Sugar	22½
Potassium metabisulphate ..	11.5 grammes.

The sugar should be dissolved in water by heating, the scum removed, and the syrup filtered through cloth. The syrup should be cooled to about 110°F before adding the lime juice. The preservative is added, dissolved in a small quantity of clean boiled and cooled water. Empty bottles used for filling should be sterilized in boiling water for 30 minutes. After filling with the squash, the bottles should be closed with sterile crown corks or well fitting ordinary corks. The following data are of commercial importance :—

	LB.
Weight of 10,122 limes used on twenty occasions.	930.3
Percentage of peel	53.4
Percentage of juice	44.6
Number of bottles of squash prepared (22 to 24 oz.)	759

The yield is slightly less as some juice was utilized for other experiments. About a dozen fruits are required to prepare a 24 oz. bottle of lime squash.

7. *Lime juice cordial*.—During the year, lime juice was allowed as before to clarify by itself, after adding 0.08 per cent of potassium metabisulphite as a preservative. About 25 to 30 per cent of the juice stored was lost as sediment. From juice stored in a 5-gallon carboy, 80 to 85 bottles of lime juice cordial (24 oz. capacity) of 55 degrees Brix. could be prepared. During the year, 581 bottles of cordial were prepared. Due to lack of a sufficient number of glass carboys, larger quantities of lime juice could not be stored. A few bottles of cordial of medium sugar, namely, 40 to 45 degrees were also prepared to study their keeping quality.

8. *Orange squash*.—Orange squash prepared from orange juice blended with half its weight of lime juice had very good keeping quality as regards taste and flavour. The squash should be of about 60 degrees Brix. When the blend of orange and lime juices is in the ratio of 1 :1, the squash should be at least of 60 to 65 degrees Brix. as, otherwise, the squash will be highly acid in taste. A 1 :1 orange squash will, however, have the more dominant lime taste and flavour. This could be overcome by adding citric acid instead of lime juice to raise the acidity of the squash. A blend of 2 :1 or orange and lime juices is preferable for the preparation of Chinese orange squash as it does not introduce too much of the lime juice flavour to the orange squash.

The off-season Chinese oranges which are green have juice of high acidity, being about 1.5 per cent sometimes. The yield of juice is low and about 40 to 45 per cent only. The squash prepared from these fruits has a characteristic taste and flavour which is very much liked by many people. The large size Chinese oranges, especially those having a diameter greater than 3½ to 3¾ inches

are mostly pithy and contain very little juice. Fruit of 3 inches size and slightly below are, however, suitable for juice extraction. The Chinese oranges left over in the machine grading at the Kodur Fruit Growers' Co-operative Society, Limited, Kodur, were found useful for the preparation of orange squash. The society was finding it much difficult to dispose of this fruit in the fresh fruit market

9. *Lemon squash*.—In a series of six experiments, 276 bottles of lemon squash were prepared. The method adopted was almost the same as for lime squash. A 55° squash was found to appeal to many people. Lemon squash prepared from peeled fruit has poor flavour. It is, therefore, necessary to fortify the flavour to some extent by adding peel emulsion. Addition of emulsion of peel from about four per cent of the fruit taken for extraction was found to impart slightly bitter taste to the squash. This is mostly due to the oil contained in the peel. To avoid this, the fresh peel was squeezed to remove most of the oil and then ground up with water to form an emulsion. The lemon squash prepared by adding this modified peel emulsion had good lemon flavour. From 1,648 fruits of average size, 276 bottles of lemon squash were prepared, i.e., about six lemons are required to prepare one 24 oz. bottle of lemon squash. The yield of juice is less than in the case of limes and is about 35 per cent only.

10. *Cashew apple syrup*.—The cashew apple syrup prepared in the laboratory was very much appreciated by the public. The acrid taste toned down completely during storage of the bottled product. The best method is as follows. The freshly expressed juice from well-ripe fruit is heated rapidly to boiling and cooled quickly. On heating, the proteins get coagulated. The heated juice is allowed to settle overnight, the clear supernatant liquid syphoned off the next day and used for preparing cashew apple syrup. On adding lime juice to this in the ratio of 2 :1 to raise the acidity, a copious flocculent precipitate is formed. This shows a tendency to settle down rapidly, but it cannot be removed by filtering through cloth. It is converted into squash of 55 or 60° Brix. and preserved by the addition of potassium metabisulphite at the rate of 0.06 per cent. During storage, the bottled product generally develops a light purplish colour which makes the product look very attractive. After storing for three to four months, the taste and flavour of the product are considerably improved.

11. *Mango squash*.—Juicy types of mangoes are well suited for the preparation of mango squash. Varieties like Hamlet give good squash. The fruit is peeled, sliced and the pulp softened by heating with twice its weight of water. It is then passed through a pulping machine and the pulp strained through muslin cloth of fairly wide mesh. Lime juice or citric acid is added to raise the acidity of the final squash to about 2 per cent. A 60 to 65° squash is found to retain the flavour well. The addition of lime juice to

some extent makes the delicate flavour of the mango. The addition of citric acid is, therefore, to be preferred. Mango squash is a product of considerable commercial importance in the Madras Presidency which produces large quantities of high quality mangoes.

Seventy-five bottles of mango squash were prepared and stored for further observation.

12. *Sapota squash*.—Preliminary experiments were conducted on the preparation of sapota squash. The pulp of ripe fruit was heated with an equal quantity of water for about five minutes and pressed in cloth. The extract was of 11.6 degrees Brix. and 0.50 per cent acidity as citric acid. It was converted into squash of 60 degrees Brix. by addition of sugar, and the acidity of the squash was increased by 1.0 per cent by the addition of citric acid. The squash was of a pale straw yellow colour and had good taste and flavour. In another experiment, the extracted juice was blended with lime juice into the ratio 3:1 before conversion into squash. The lime juice suppresses the delicate flavour of the sapota.

13. *Passion fruit squash*.—The passion fruit, which is round in shape, has a light purple shell. A large number of small black seeds are enclosed in a gelatinous mass of yellow pulp which has a characteristic flavour. The seeds cannot be easily extracted from the pulp. This is a disadvantage in using the fruit. To extract the pulp for squash preparation, the gelatinous mass was heated for about ten minutes with an equal quantity of water and pressed in cloth. The extract which was of a bright yellow colour was 8.1 degrees Brix. and 1.26 per cent acidity as citric acid. It had a pH. of 3.2 as tested by a B.D.H. Capillator. From this squash of 60 degrees Brix. was prepared. The squash was clear and of deep yellow colour. It had agreeable taste and flavour and kept well on storage.

14. *Citron peel syrup*.—The syrup left over in the candying of citron peel was converted into a good beverage, by mixing with lime juice to raise the acidity to the proper degree. The original syrup which was of 66.5 degrees Brix. when diluted with lime juice in the ratio of 3:1, had an acidity of 2.5 per cent. The syrup prepared thus had very good taste and flavour.

Jams and Jellies.

15. *Mango jam*.—The pulp left over in the canning of mangoes can be profitably utilized for jam making. It is softened by heating with about one-third its weight of water. To the pulp an equal weight of sugar is added. To improve the taste and flavour of the jam, tartaric acid is added to the extent of 0.5 per cent of the weight of fruit and sugar combined. The mixed pulp and sugar is heated rapidly to boiling over a quick fire. When the temperature reaches 220° F. it is removed from the fire, allowed to cool slightly and filled into jam jars. When the jam is set, the top of the jam is covered with a thin layer of paraffin wax to prevent mould

growth. This paraffin covering will not be necessary if well sealing jam jars of Sutax type are available for packing. The jam can also be packed hot in lacquered cans. The jam prepared has very good taste and flavour, and keeps well on storage.

16. *Orange marmalade*.—Kichili or Vadlapudi fruit are well suited for the preparation of orange marmalade. The fruit is peeled and the pulp cut into thin slices. The slices are just covered with water in a shallow pan and heated slowly for about 30 minutes to extract the pectin, sugars and acid in the pulp. The extract is poured into a thick cloth bag and allowed to filter through slowly. A second extract also is taken. The clear filtrate, which is rich in pectin as seen by the alcohol test, is used for making marmalade. An equal quantity of sugar is added and boiling carried out rapidly to about 220° F., when the boiling will be finished. Shreds of peel of sweet oranges like the chinese orange which have been softened by a preliminary boiling in water are added just before finishing boiling. The marmalade is allowed to cool slightly before bottling so that the shreds may not float up. The marmalade thus prepared has excellent taste and flavour.

17. *Apple jelly*.—Irish Peach, an important variety of apple grown in the Nilgiris, was utilized for jelly making. The first extract which was taken by adding to the slices 1½ times their weight of water was of 4.2° Brix. and had 0.47 per cent acidity as malic acid. The second extract was taken from the residue using an equal weight of water. The two extracts were combined after filtration. The mixed extract was of 3.7° Brix. and 0.39 per cent acidity. The third extract with an equal weight of water was of 1.6° Brix. only. This also was added to the first two extracts. Next morning, the clear filtrate was syphoned off from the small sediment at the bottom of the settling vessel. It was boiled down rapidly from 8½ lb. to about 5½ lb. before adding 4 lb. 6 oz. of sugar. This corresponds to the addition of an equal weight of sugar to an extract of about 7° Brix. To form a satisfactory jelly, the extract should be at least of about 6-7° Brix. Boiling was carried out rapidly and finished at 220° F. The jelly was allowed to set in glass bottles. It had good set and was of an attractive golden brown colour. The taste and flavour also were good.

18. *Guava jelly*.—Cut out experiments on guava jelly showed that the product canned in lacquered A-1 size cans had excellent set, taste and flavour. It is, therefore, possible to utilize for jelly preparation the trimmings, etc., left over during the canning of guavas. The addition of lime juice to the fruit-sugar mixture leads to a clearer and brighter jelly with excellent taste.

Candied and Crystallized Products.

19. *Citron peel candy*.—A series of experiments were carried out to evolve a suitable method for the preparation of citron peel

candy. The fruit was cut into quarters or eight pieces and cured in brine starting with 5 per cent strength and gradually increasing it to 10 per cent. The fruit was kept immersed in the brine to prevent mould growth. When the peel had cured sufficiently so that the pulp could be easily scraped off, it was washed in water to remove salt and candied in sugar syrup as usual. The citron peel candy prepared had excellent taste and flavour and was quite attractive in appearance. The syrup left over was converted into citron peel syrup after refining.

20. *Drying and dehydration.*—The small dehydration room which was being used to carry out dehydration trials was not available as it was taken back by the Fruit section. Further experiments were conducted with the preparation of banana flour and banana figs. Observations in storage of the dehydrated products were continued. In the case of banana flour and banana figs, the products attract weevils, etc., when stored in glass bottles or tins with loose fitting stoppers. If, however, the product is packed hot straight from the drying trays and kept in glass bottles, with properly fitting stoppers, the spoilage due to insects is minimised. It is desirable to heat the final product for about 5 to 10 minutes at 57–7° C. before the final packing. Small paper cartons were successfully employed for distributing the dried products for sale in small lots. There is much scope for the development of the banana dehydration industry as the banana flour is likely to be of considerable importance in the preparation of synthetic and patent foodstuffs.

By-products.

21. *Orange oil.*—Orange oil which was extracted by hand pressing of the peel of freshly picked Kichili fruit had kept well on storage in bottles, even after 18 months. The colour was bright yellow and the flavour was highly pleasing. There were numerous enquiries for this orange oil from pharmaceutical firms. It is possible to prepare about 10 lb. of oil from one ton of fruit. Nearly 6,000 fruits make up one ton. Very little equipment is required to express the oil. It should be possible to produce a pound of orange oil by this method at a cost of about Rs. 15 even if it is decided to throw away the fruit. It has, however, been found that the fruit can be used for the preparation of orange marmalade and orange squash.

22. *Technical advice.*—During the year, 33 important enquiries were attended to. They were mostly from capitalists, industrialists and agriculturists. Detailed information both technical as well as advisory, was given on such important subjects as canned products, preparation of juices, squashes, and cordials, jams and jellies, dehydrated products, candying, orange oil, etc. The enquiries were from all parts of the Presidency. There is considerable interest about the subject of fruit and vegetable preservation.

23. *Training.*—Sri K. T. Kalaiah, a student deputed by the Coorg Administration, was given three months' training from 1st March 1945 to 31st May 1945 in fruit canning and preservation. Several enquiries were received regarding admission for training.

24. *Exhibition.*—Fruit and vegetable products were sent to fifteen exhibitions in order to popularise the products standardised in the laboratory and to create public interest in this new industry.

25. *Visitors.*—A large number of distinguished visitors were shown round the Fruit Products Research Laboratory and the work being done explained to them. The Laboratory has become a centre of attraction for many persons in all walks of life.

26. A statement of expenditure and income for the period 1st July 1944 to 30th June 1945 is given below :—

40. C. Agriculture—Experimental FARMS—A AGRICULTURAL RESEARCH STATIONS—Canning.

	RS.	A.	P.	RS.	A.	P.
A. Pay and allowances—						
1 Pay of officer and staff	5,996	12	0	..		
2 War and dearness allowance	1,225	0	0			
3 Travelling allowance	880	1	0			
Total of pay and allowances				8,101	13	0
B. Contingencies—						
1 Purchase of dead stock	2,006	2	8			
2 Other contingencies	2,156	15	1			
3 Dearness allowance to menials	140	0	3			
Total of contingencies				4,303	2	0
Grand total				12,404	15	0

KODUR,
2nd August 1945.

G. S. SIDDAPPA,
Biochemist.

ADMINISTRATION REPORT OF THE RESEARCH ENGINEER FOR THE FASLI YEAR 1944-45 (1st JULY 1944 to 30th JUNE 1945).

I submit herewith the seventeenth administration report of the Research Engineering Section for the Fasli Year 1944-45. The report is the sixth of the series after the amalgamation of teaching and research effected in 1938. I remained in charge of the section throughout the year under report and was in direct charge of the teaching in Agricultural Engineering for the Second year class of the B.Sc., Ag. course.

2. There was a decided improvement in the position as regards releases of iron and steel required for agricultural purposes and even though releases were made in reasonably increased quantities the actual supplies from the manufacturers and the controlled stockists fell considerably short of the authorized sales. The actual releases commenced from the third quarter of 1944 and systematically advanced during the successive periods whereas receipts against indents placed on these releases began to arrive in small quantities only from the first period of 1945. Notwithstanding the sustained efforts of the department to get more iron and steel for ryots' requirements and the gradual increased quotas allotted by the Iron and Steel Controller against such demands, the supplies are still very much short of the consuming capacity by a large percentage. The pressing need for more iron and steel for increased food production has also been realised by the Government of India and this was specifically stated at the conference of the provincial and states' representatives held at New Delhi under the auspices of the Imperial Council of Agricultural Research about the middle of August 1944 where the Iron and Steel Controller was also represented and this is expected to further help agriculturists.

3. As a result of the changed conditions respecting the raw material position for the manufacturers of agricultural implements and machinery, the activities for the supply of sales and distribution of approved types of ploughs and other improved implements which had been virtually suspended during the previous years on account of the war situation, were resumed and arrangements made for their production and stocking. Owing to the prevailing rail transport restrictions the controlled production arrangements were made only with the Messrs. P. S. G. & Sons of Peelamedu and to the extent to which ready stocks with the agents and representatives of the other two manufacturers, viz., Messrs. Kirloskar Brothers and Messrs. Cooper Engineering, Ltd., these were also sold to ryots wherever available. The price of standard iron

and steel continued at the same level as during the previous year and it is expected that graduated cuts will be introduced to bring down the market slowly and enable the existing stocks to be cleared without heavy losses. Prices of ploughs and other implements were strictly controlled and the manufacturers were compelled to submit their costings sheets for departmental scrutiny and check before their prices were approved. In all price fixation cases, the percentage of profits was limited to ten per cent on the over all manufacturing costs. Many producers and fabricators were however unwilling to supply under these restrictions but the orders were accepted only from such of the concerns who agreed to this departmental control and profit restriction.

4. Sales of iron ploughs and other agricultural implements effected through the Demonstrators' depots and direct by the manufacturers to ryots were more than double the totals for last year. Sales for 1943-44 totalled only 2,900 and the totals for the year under report amounted to nearly 5,900. Considering the corresponding figures for 1942-43 this year's total represents a 31 per cent increase. The major portion of these sales took place during the second half of the year from which period alone the implements were more freely available. The maximum sales of ploughs were made in Tanjore district amounting to 536 of which 234 were purchased by the ryots in the Pattukkottai taluk. Chittoor comes next with a total of 435 and Anantapur ranks third with 338 ploughs. Spares for ploughs were in great demand and a good portion of these indents was completed by the manufacturers although a small balance still remained to be complied with. Nil reports of improved ploughs sales have been sent from Nilgiris, Ellore, Nellore and Guntur.

5. To meet the demand from a large number of District Agricultural Officers for an iron plough midway between the popular cooper No. 11 and the Victory, a design has been completed with an adjustable bar point share and an inclined land side. Three sample ploughs of this type have been received from the manufacturers Messrs. P.S.G. & Sons and these are now awaiting field trials under different conditions. This has a high carbon steel plough share and should wear very much longer than any other chilled plough. Twelve more have been ordered for district trials under ryots conditions. The use of high carbon steel for plough shares is being appreciated now by ryots on account of its longer life and greater durability and they do not hesitate to spend a few extra annas to get this superior metal. As slight reduction in the prices of a few popular types was made possible with effect from the end of April 1945 due to the large orders and the improvements made in the manufacturing methods, the manufacturing processes are being systematically checked to cheapen costs and make these available at as low a price as practicable under the current conditions from time to time.

6. To meet the urgent demands for country plough shares in the absence of availability of the regular sections ordinarily employed for making them, experiments were conducted with the scrap buffer springs received from the railway workshops and sample shares were made and tried with country ploughs. They are comparatively more expensive on account of the extra labour and fuel required for flattening out the coils and forging the cut bits to the required length and shape. These preliminary tests have proved successful due to exceedingly efficient performance of this type of material. The results have been sent to the District Agricultural Officers and orders are received from some of them for bulk supplies of the spring steel shares. Government permission has also been obtained for the inclusion of this item under the trading scheme, supplies to be made by utilizing the resources of the rural blacksmiths for their fabrication.

7. Due to the several demands made in other directions of the services of Agricultural Demonstrators and their subordinates there is practically no conduct of the improved plough and implement demonstrations and even though this is not systematically performed now as during the pre-war days, there is a growing demand for these types of implements from all classes of ryots engaged in farming. If there had been adequate stocks of in either the departmental depots or with the stockists representatives in the different parts of the Province, the sales would have been more than during any of the previous years for which records are available. It is a clear and prominent indication that the cultivator is more alive to-day than at any time before the advantages and greater efficiency of good implements in all agricultural operations and that the improved implements are now finding a ready purchaser in the ordinary ryot without any special propaganda is a very good augury for the future of new implements and machinery designs and production. Provided prices are kept within the means of the general class of ryots there is a very good range for the spread of new implements and improved machinery equipment in this Presidency.

8. *Roll easy mhote wheels.*—With the fuller realization of the advantages of cast iron mhote wheels in regard to durability, lighter draught and shock free pull, the demand continues to increase for this equipment. Experiments carried out for the local manufacture of the small type of ball bearings required for their production had to be abandoned on account of lack of the correct size of steel balls. The case for the importation under the prevailing restricted shipments of foreign made ball bearings was placed before the Director-General of Munitions Production through the Government of India and quarterly releases have been obtained from the Controller with effect from the commencement of the current calendar year. Mhote wheels are now made with these controlled ball-bearings imported from the United States of America and their supplies are made to ryots at fixed prices through the

agricultural depots in the districts. The total number of mhote wheels supplied during the year amounted to 931 and large orders are still pending partly on account of manufacturers' difficulties and partly due to want of the requisite numbers of ball bearings. Considering the rate of arrivals and the improved quotas now allowed when compared with the first supplies, the position is likely to improve considerably during the coming months.

9. *Grading machines.*—During the year under report there were several demands from the Co-operative Fruit Growers' Societies in Cuddapah for orange graders and these were all forwarded through the Provincial Marketing Officer. Owing to the continuance of the obstacles in the matter of getting the raw materials needed for their manufacture, these orders were not taken up and only one orange grader was made for the Cuddapah Fruit Growers' Co-operative Society on the special request of the local District Agricultural Officer.

A new line for which mechanical sorting appliances were requested for is the onion marketing interests and this is specially on account of the big demands for large size onions from the dehydration factories. The design of the orange grader was suitably modified and a machine was sent for trials to the dehydrating factory. This has been reported as satisfactory and another machine is now being got ready for further trials at another centre near Palani as suggested by the District Agricultural Officer, Madura. More machines will be supplied on the decision of the Provincial Marketing Officer, to establish grading centres for onions.

All the orange and lime fruit grading machines supplied to the Fruit Growers' Co-operative Societies are reported to be working satisfactorily and these may now be considered to have attained a working standard for basing and planning further developments in this direction. The Kodur Society have asked for four new machines for their additional grading centres.

10. *Bund-formers.*—Twelve wooden bund-formers of the medium size were made here for the District Agricultural Officer, Cuddapah, as a none of the firms were willing to make this small number as a special case. Ryots have a feeling that wooden bund-formers are not so lasting as the all steel implement and this is correct to a large extent since the all steel one is stronger than the wooden ones and is not likely to breack under rough usage as in the case of wooden bund-formers. There is therefore still the demand for the all steel bund-formers even though the price is nearly double. Indents for this labour saving contrivance are now being received in larger numbers by the department for supplies under the price control arrangements for manufacture and sales. The implement may be expected to regain its old popularity among the garden land cultivator and the dry farming ryot as more supplies become available.

11. *Chaff-cutters*.—The scheme for the first instalment manufacture of fifty machines was sanctioned by Government but only a portion of the steel and timber have been received and so far 26 machines have been made. As requested by the Director of Veterinary Services, the veterinary hospitals at Salem, Chittoor, Bezawada, Bobbili, Ongole, Vellore, Erode and Guntur have each been supplied with a machine for demonstrations as also the livestock Development Officer, Hosur. The District Agricultural Officers of Salem, Coimbatore, Tanjore, Bellary, Guntur and Anantapur, have also been supplied with one machine each for demonstrations. Besides the Government depots mentioned above, machines have also been sent to the Cotton and Millets Breeding Stations, the Dry Farming Station, Hagari, the Central Farm and the Bapatla Agricultural College. Four machines have been taken by leading ryots for trials with a view to purchase them if satisfied.

As a result of the working of the machine for over a year nearly some more improvements have been found necessary for making it more robust and lessen adjustable links and these have improved the performance when used under rough and exacting conditions. A sample of this new model has been sent to the local works for submitting their quotations together with their prices for bulk supplies. Reports received so far have been very encouraging and the machine promises to become popular with more demonstrations and a slight reduction in price. The cost under the prevailing conditions would amount to nearly Rs. 40 or thereabouts.

12. *Agricultural tools and small implements*.—Experiments started during the previous year for the manufacture of small hand tools such as sickles, hand hoes, hand forks, required by ryots proved successful and with the growing inclination of the ordinary ryot to invest in good quality implements even if the cost was slightly high, further efforts were made to have them manufactured by rural blacksmiths under controlled price conditions. Proposals submitted to Government for making these small tools on a large scale and sell them to ryots under the trading schemes have been approved and the scheme is now in regular operation. In addition to sickles and handhoes, country plough shares are also included in this scheme and there is steady demand for all these three classes of tools. The total number of tools and steel plough shares supplied to the various districts are given below:—

Sickles	5,028
Handhoes	1,657
Plough shares	300

The District Agricultural Officers of Mangalore, Coimbatore, Nellore, Anantapur, Salem, Tanjore, Pattukottai, Madura and Nilgiris have been supplied with these tools. For their manufacture scrap buffer spring materials were obtained from the Regional Deputy Iron and Steel Controller and later non-standard low

carbon spring steel flast were supplied and the latest consignments were of standard sizes. At the start there were only a few fabricators and high price work rates were demanded. After being in operation for a couple of months, more rural blacksmiths have now come forward and the price work rates have now been reduced from two to three annas on the several items. But the cost of the raw material which worked out to only $1\frac{3}{4}$ to 2 annas per pound has now gone up to $3\frac{1}{2}$ annas so that the all in sales rates could not be lowered very much as anticipated at first. Attempts are, however, being made to bring down prices and there are indications pointing to its possibility in the very near future.

13. *Tractors and tractor ploughing operations*.—During the year under report tractor ploughing operations were mainly concentrated at Coimbatore and Vizagapatam districts. The case tractor was in operation for nearly nine months and ploughed an area of 811 acres. On account of the urgent requirements of mechanical ploughing tackle at Araku in Vizagapatam district, the old 10/20, McCromick Deering Unit at Pattukottai was withdrawn from Pattukottai and sent with the new plough purchased from Messrs. Volkart Brothers, Karachi, and the tractor disc harrow to Araku Valley. Working for two months these units have reclaimed an area of 200 acres and nearly half of this ploughed block has also been harrowed. Without this outfit it would not have been possible for the stipulated area to be brought under cultivation. During the year an extent of only 144 acres in different parts of the Pattukottai reclamation zone was tractor ploughed. The total acreage tractor ploughed all over the province amounted to nearly 1,200 acres and nearly 100 acres were tractor harrowed against 600 acres tackled for the previous year. A good deal of interruptions in ploughing were caused by small breakdowns mostly with the tractor ploughs and on account of lack of the correct spares and these had largely to be made here at the workshops. The experience of this year further strengthens the conclusions that to ensure the success of tractor operations an ample reserve of spares are needed not only for the tractor but also for the ploughs and other auxiliary tillage attachments.

Of the three lease-lend tractor received from the suppliers, only one unit was put on the field at Araku and the other two units at Madura and Bellary remained idle on account of the non-receipt of the relative tractor ploughs at these centres. A second-hand tractor was purchased from a ryot at Kurukkulpatti in Salem district and this was also employed for regular ploughing operations.

Eight new units of the class IV groups, four with wheeled tread and four with caterpillar treads were ordered for undertaking large scale tractor operations in the provinces for which there is demand from several districts.

14. *Groundnut godown construction.*—Of the first series of ten godowns works have been completed at eight centres. The godowns at Tindivanam, Villupuram, Ulundurpet and Vridhachalam have been handed over to the South Arcot Groundnut Marketing Committee for operating them. The godowns at Nandigama, Arni and Ariyalur have been handed over to the respective Co-operative Loan and Sales Societies and are regularly functioning. That at Kurnool is being used temporarily by the Collector for storage of foodgrains as an emergency measure. Construction at Tadpatri is in the terrace stage and this is expected to be completed shortly. Works at Adoni are at a standstill due to the failure of the contractor. Fresh tenders have been invited for the execution of the balance of items at this place and sanction sought for the acceptance of the tender and additional expenditure involved. New centres at which works were commenced are Amudlavalasa, Vizianagaram, Guntur, Bellary, Prodatpur, Tirupattur and Vayalpad. The works are progressing at all these places and are expected to be complete before the end of the calendar year. Unlike the anticipations of the last year working conditions became more adverse and difficult in the matter of obtaining the requisite building materials and labour and transport became further controlled making movements extremely difficult. Considerable delays occurred in getting the cement, timber and iron and steel required for these works and the works could not be proceeded with as programmed on account of these restrictions. Claims for heavy losses incurred by the various contractors were made and in a few cases where there were earnest attempts made, a compensatory compassionate grant was recommended. A good deal of delays and difficulties are experienced in obtaining the rail movement permits for goods from one region to another under railway zone.

15. *Malt extract and food factory extensions.*—All sanctioned works connected with the increased production of malt extract mixed shark liver oil were completed. A fresh item not originally contemplated but subsequently found necessary for the quick filtration of the mashed liquid from the steaming vats in the form of a filter press was also added. It goes to the credit of the local works to have made this filter press in a very short time and supplied it for trials before purchase. Other machinery and appliances required for the stepping up of the malt food production were also completed. The installation of the new higher horse powered motor for the main shaft has been held up for want of a starter. Work connected with the second activated carbon furnace was finished and this unit was put into regular operation. As a measure to protect the dust nuisance inside the factory premises, the whole of the yard was cement concreted and this has added considerably to factory hygiene.

16. *Cotton seed crusher.*—To meet the pressing demand for a simple manual power contrivance for pounding cotton seed intended for cattle feed the design of a suitable machine was taken up as

an urgent measure. A stone base with a conical hopper cut in it forms the seed container and the pounder is a simple cast iron cylindrical weight worked through a guide pipe and operated from a foot pedal. The machine is nearing completion and during the preliminary trials it has given satisfaction when the seed is wetted with a small quantity of water. One man can easily operate the machine and the pounding is done very efficiently. The design is intended to serve the rural small ryot where no power is available and only manual labour is to be employed, for such purposes. By providing a change shoe at the bottom of the pounding weight the machine can also be used for paddy pounding and also for other grains. Experiments are still in progress in regard to this side of the design and different weights and shapes are under test.

17. *Stirrup pumps—Conversion into sprayers.*—With a view to utilize the large numbers of stirrup pumps now available with the civil defence directorate, experiments for the design of a simple replaceable spray nozzle in place of the usual jet nipple supplied with these fire fighting appliances were conducted and two good nozzles capable of giving a strong, uniform and even spray were designed and these are found suitable for a number of types of stirrup pumps. Demonstrations were carried out with these modified spray pumps and these were very successful for regular spraying. Based on these experiments large scale conversion proposals have been submitted and these are now awaiting sanction.

18. *Manufacture of digging forks.*—Successful attempts were made to get the special carbon steel specially rolled for the manufacture of high digging forks and a consignment of 25 tons was obtained from the Bhadravathi Iron and Steel Works, and supplied to Messrs. The Metal Industries, Limited, Shoranur, for making these forks. Sample forks made of this material have been forwarded to the District Agricultural Officer and Curator, Nilgiris, for tests. These are now under field tests and large scale production will be taken as soon as satisfactory reports are received.

19. *B.Sc. (Ag.) Course Students' Classes.*—This year marks the beginning of the increased admissions to the B.Sc. (Ag.) degree course classes. Practical and lecture classes for the second year continued as usual but there were four practical classes in a week against the normal two days for the first year. Lectures and practicals in Mechanical Engineering and Agricultural Machinery were taken up by me for the second year course and by the assistant for the First year class. A special feature of the year was the excursions to local works to enable the students to get a first-hand idea of the production of agricultural implements and machinery on a manufacturing scale. Further extensions were carried out to the students workshop for accommodating the extra classes.

B.Sc. (Ag.) Second year had twenty-five lecture classes and 138 practical hours.

B.Sc. (Ag.) First year had nine lecture hours and 114 hours of practicals.

20. *Workshops*.—The workshops remained active and busy throughout the year and catered to the needs of all the officers of the College and Research Institute and the District Officers in the presidency besides attending to the usual demands of the research activities of the section and the Malt Factory requirements both of which are expanding steadily year after year.

21. *Visitors*.—Among the several visitors special mention needs to be made of Sir S. V. Ramamurthy, K.C.I.E., I.C.S. Mr. J. B. Priestly, Advisers to His Excellency the Governor, Rao Bahadur Dr. B. Viswanath, C.I.E., Mr. A. Khaleeli, I.C.S., Directors of Agriculture and Industries, respectively, and members of the Board of Honorary Visitors.

23. *War effort and Savings Drive*.—Forty-eight ten-rupee and 21 five rupees defence savings bonds amounting to Rs. 600 were purchased against Rs. 496 saved during the previous year. The scheme continues to function satisfactorily and regularly.

COIMBATORE,
18th August 1945.

B. M. LAKSHMIPATHY,
Research Engineer.

ADMINISTRATION REPORT OF THE SENIOR LECTURER IN AGRICULTURE AND SUPERINTENDENT, CENTRAL FARM, FOR THE FASLI YEAR 1944-45.

I continued to be in charge of the office of the Senior Lecturer in Agriculture and Superintendent, Central Farm, during the year under report except for one month from 22nd May to 21st June 1945 when I went on leave. Sri V. T. Subbiah Mudaliyar, Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm, was in additional charge during my leave period. There was no change in the personnel of the Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm. Sri V. Suryanarayana, Gazetted Assistant in Agriculture, sanctioned in G.O. No. 2776, Development, dated 27th June 1944, reported for duty on the 31st July 1944, afternoon. Sri K. C. Ramakrishnan, Lecturer in Agricultural Economics, continued as such during the year.

2. During the year under report, Teaching Assistants in Agriculture, Sri C. S. Krishnaswami Ayyar, Sri T. Nataraj and Sri A. H. Subrahmanya Sarma were transferred for district work and in their places Sri S. Ramaswami Ayyar, Sri L. Krishnan and Sri I. Sambasiva Rao were appointed. Among the farm staff Sri P. K. Natesa Ayyar and Sri K. Hanumantha Rao were transferred for district work and their places were taken by Sri N. Srinivasa Rao and Sri C. R. Venkataraman. Sri T. V. Navaneethakrishnan and Sri N. Thyagarajan joined the Central Farm from district work. Sri P. V. Narasimham joined as Assistant Lecturer in Animal Hygiene in one of the vacant posts. An additional Assistant Lecturer in Animal Hygiene sanctioned in G.O. No. 1070, Development, dated 16th March 1945 was filled by the transfer of Sri S. N. Vaidyanathan, from the Veterinary College, Madras. Consequent on the opening of the Bapatla Agricultural College, Sri Francis Joseph was transferred as Lecturer in Animal Hygiene for the Agricultural College, Bapatla, and his place was taken by Sri K. Mukunda Rao transferred from Erode.

3. The four posts of Assistants sanctioned in G.O. No. 1300, Development Department, dated 23rd March 1944 to assist the Lecturer in Agricultural Economics were converted into two posts of Laboratory Assistants to the Lecturer in Agricultural Economics. One post was filled by the appointment of Sri V. S. Narasimham. The other post could not be filled up for want of qualified candidates.

4. Messrs. T. S. Francis and S. M. Sulaiman, who were appointed as Probationary District Agricultural Officers, reported for training at the Central Farm for three months on the 20th April 1945. They continued to be under training during the rest of the year under report.

5. To run the parcel cart from the Agricultural College, which was hitherto run by rotation by the various sections, a clerk and a peon were sanctioned in G.O. No. 3132, Development, dated 17th July 1944 for one year. This post was attached to the Central Farm and the work commenced from 1st August 1944.

6. Consequent on the transfer of Sri S. Varadarajan, Dairy Clerk, to the Director of Agriculture's office, Sri S. Seshadri was drafted from the Deputy Director's office as a Farm Clerk of the Central Farm.

7. *Teaching.*—During the year under report the strength of B.Sc. (Ag.) Class I was increased by admitting 96 students against 48 in the previous year. The following classes were held for B.Sc. (Ag.) students. There was no short course during the year:—

Class.	Agriculture.		Animal Hygiene.	
	Theory. (Hours).	Practical. (Hours).	Theory. (Hours).	Practical. (Hours).
I	68	371	52	214
II	95	336	49	150
III	66	378	..	..

Sri H. Narahari Rao, Poultry Officer of the Veterinary Department, delivered three lectures in Theory and conducted two practical classes on poultry-keeping.

8. *Tours.*—The students of B.Sc. (Ag.) Class II were taken on tour to the Nilgiris, Madura and Koilpatti, to study the local cultivation of crops. The final year students were taken to Madura, Dindigul, Salem and Mettur. They were also taken to Peelamedu and Podanur to study the local farming and to the sugar factory at Podanur.

9. *War effort.*—Batches of sepoys of different linguistic areas were sent for training once in three months for training in the Central Farm. In addition to their training, 21 men of army personnel reported for training. They were given training in field operations in addition to lectures and demonstrations according to the approved syllabus. The sepoys had 22½ hours of lectures and instructions on the treatment of common ailments and contagious diseases of cattle and poultry and general principles of hygiene given by the Lecturer in Animal Hygiene. Besides this training, members of this section delivered nine lectures to the military recruits stationed at Madukarai on various subjects connected with Post-War Reconstruction. In addition, there were weekly visits to the farm by the military personnel from Madukarai. The Victory Day was celebrated with great eclat on 9th, 10th and 14th May 1945.

10. *General.*—I toured in the City of Madras and round about Madras in Chingleput district to investigate and report on the possibilities of increasing the fodder supply to provide green fodder

for milch cows in the City of Madras. My report was submitted to you in this office letter No. C. 75/45, dated 13th March 1945. I also toured in Guntur and Parlakimidi for selection of milch animals for the dairy. The Gazetted Assistant in Agriculture visited the West Godavari Lankas to study grazing facilities for cattle. He also visited Poultry Research Station, Madras, to study conditions of poultry rearing. He attended Tiruppur Cattle Show and also toured along with the students in their tours. The Lecturer in Agricultural Economics and the Junior Lecturer in Agriculture accompanied the students on tour.

At your instance the problem of the disposal of a large surplus of skimmed milk available with the military authorities was investigated and a report on its utilisation was sent to you.

Thirty-nine newly posted Upper Subordinates were given training for one month from 12th June 1945 in the methods of propaganda and demonstration work. They were also taught the maintenance of various accounts including trading schemes in the district work.

11 *Veterinary Hospital.*—During the year 215 in-patients and 2,676 out-patients were treated as against 266 in-patients and 2,449 out-patients of the previous year. Four hundred and twenty-four castrations were done as against 350 of the previous year. There was no epidemic among Government animals except foot and mouth disease which broke out among the Central Farm animals in a mild form. Necessary preventive measures were taken immediately. The daily average attendance was 43.11 as against 37.8 of the previous year. During the year fowl pox broke out in the college estate. All the fowls kept in the poultry farm were protected against the disease. In all 156 major and 192 minor operations were performed as against 49 and 166 respectively in the previous year. Three hundred and eighty specimens were examined under microscope during the year. The health of the working cattle of the Central Farm and the Dairy animals including stud bulls was, on the whole, good. Fifty-one bovines belonging to Central Farm, Dairy and residents of the estate were protected against rinderpest. Two hundred and two cows were served by Government stud bulls. Twenty-seven calves born to Government breeding bulls were inspected.

The Livestock Development Officer, Hosur, inspected the breeding bulls stationed in the hospital. The Director of Veterinary Services, Madras, and the District Veterinary Officer, Coimbatore, inspected the hospital on 15th October 1944 and 29th March 1945, respectively.

12. *Farm labourers' school.*—Sri A. Natarajan, farm school teacher, continued to be in charge till 1st February 1945 when he was replaced by Mrs. V. Damodaram, a lady teacher. She continued to be in service till the end of the year. The average

number of boys on rolls was 30 with an average attendance of 23. The school worked for 281 days with 35 admissions and 17 withdrawals. The annual examination was held by the School Committee on 21st July 1944. The school was inspected by the Junior Deputy Inspector of Schools and the Deputy Inspector of Schools during the year under report.

The attendance was not as satisfactory as could be desired, due to the economic conditions prevailing and to the parents withdrawing the boys for labour. The total expenditure of the year including the wages paid to the boys was Rs. 970.

13. *College dairy*.—The dairy herd started with 12 cows, 11 calves and one bull at the beginning of the year and closed with 18 cows, 17 calves and two bulls. Taking all the breeds together, the average daily yield of milk per cow was 13.1 as against 16 lb. of the previous year. The average number of cross-breeds in milk maintained was 5.8 only as against 8.4 of the previous year. The total milk yield during the year was 45,491 lb. The dairy produce was disposed of as below:—

	LB.	OZ.
Milk sold	33,190	0
Fed to calves and poultry ..	6,150	8
Separated	5,638	8
Miscellaneous such as starter, analysis, colostrum, etc. ..	509	0
Cream sold	9	13
Cream made into butter ..	548	13
Miscellaneous issues for examination, etc.	0	6
Butter sold	257	0
Butter made into ghee	1	2
Issued for milking and miscellaneous	11	8
Ghee sold	0	13½
Skimmed milk sold	1,832	8
Fed to calves	2,509	4
Fed to poultry	438	8
Miscellaneous	185	0

14. *Poultry*.—The stock at the beginning of the year was 71. During the year 111 chicks hatched out, 14 birds were sold, 63 birds (chicks mostly) died, one hen and ten chicks were stolen, leaving a balance of 94 at the end of the year.

During the year 243 eggs were set for hatching (155 eggs in the incubator and 88 eggs under country hen) from which 177 chicks hatched out successfully. The percentage of hatching in the incubator was 31.0 while that under country hens was 67 per cent.

The number of eggs laid during the year by each bird of the different breeds were on the average—

White Leghorn	140.2
Rhode Island Red	145.9
Light Sussex	130.0
Black Minorca	129.8
Country	107.1

One Health Inspector from Government House was given practical training in Dairying for a fortnight.

15. *Central Farm*—(a) *Season*.—The rainfall data are given below:—

	1944-45.	1943-44.
Total rainfall in inches	32.79	23.18
Number of rainy days	94	78

The south-west monsoon was weak and the bulk of the dry land sowings were done with the late rains in September. Thereafter the rains of the north-east monsoon were heavy, continuous and not conducive to crop growth and seed setting. Many of the crops had to be cut for fodder. The hot weather rains were less than normal, but facilitated the preparation of the land for the next season.

(b) The late sowings combined with heavy and continuous rains of the north-east monsoon did not permit the normal growth of the dry crops and yields were below normal. The garden land crops were however normal. The season for paddy was not favourable, as the supply of water in the tank was received rather late and the plantings were delayed and yields were poor.

(c) Facilities were provided at the Central Farm for the conduct of field experiments by the various research sections. Facilities were provided for the practical training of the University students and the military sepoy undergoing Agricultural training at the Agricultural College. Thirteen coolies deputed by the District Agricultural Officers were given practical training in the handling of improved agricultural implements and in the cultivation of crops.

(d) *Experiments*.—The major experiments dealt with the determination of (i) the amount of water required by crops for their growth, the optimum depth of irrigation and interval between irrigations; (ii) the relative manurial values of composts and cattle manure; (iii) the effect of different preparatory cultivation methods on crop yields; and (iv) the effect of nitrogenous manures on cotton yields.

(1) *Irrigation experiments*.—The quantities of water consumed by the three garden land crops, chitrail cholam, ragi and Cambodia cotton were 19.68, 26.35 and 36.20 acre inches,

inclusive of rainfall. With regard to chitrai cholam grain, two weeks' interval between irrigations and irrigation with 3 inches of water appeared the best. The chitrai cholam straw yield and the ragi grain increases kept pace with the quantities of water supplied, that is with increase in the depth of irrigation and decrease in the frequency of irrigation. Four and three inches depth of irrigation were better than two inches with regard to ragi straw. No significant differences were noted by varying the frequency and depth of irrigation in the case of Cambodia cotton.

(2) *Compost experiments*.—Composts prepared by the Coimbatore, Bangalore and Indore methods were compared with farm-yard manure. Their effects, on chitrai cholam to which they were applied, were not significant. The residual effect of the manures on the succeeding Cambodia crop was studied. Residual effect of an application of five tons of Coimbatore compost per acre was greater than those of all the others, and that of ten tons of Bangalore compost per acre was the poorest. The results are not explainable.

(3) (a) Various types of cultivation in preparing dry lands were studied on (i) periamanjai cholam, (ii) Karunganni cotton and (iii) redgram and tenai. The results have not been uniform. The results obtained this year are significant only in the following cases. No ploughing combined with hand removal of weeds was better than different types of ploughing and equal to working Guntaka with regard to tenai straw.

(b) Various types of cultivation in preparing garden lands were studied on chitrai cholam and Cambodia cotton. The effects of cultivation are not significant except in the following. Working country plough six times is better than all other treatments as far as Chitrai cholam straw production is concerned.

(4) *Cotton manurial trials*.—Varying doses of nitrogen both in the shape of groundnut cake and ammonium sulphate were applied to dry and irrigated cotton crops. The effect of such applications was not significant this year.

In the case of garden lands, early and late sowings were combined with the manurial treatments mentioned above. The early sowing proved to be significantly better than late sowings. This is in consonance with the results obtained last year.

C. RAMASWAMI,

Senior Lecturer in Agriculture and
Superintendent, Central Farm.

COIMBATORE,
30th July 1945.

ADMINISTRATION REPORT FOR THE YEAR 1944-45 (1st JULY 1944 TO 30th JUNE 1945) OF THE GOVERNMENT MALT FACTORY, COIMBATORE.

I submit herewith the administration report for the year 1944-45.

2. *Charge*.—On the 4th September 1944, I was placed in full additional charge of the Government Malt Factory, Coimbatore. The Superintendent, Sri C. V. Ramaswamy Ayyar, was relieved the same day on long leave preparatory to retirement. Soon after taking over charge of the Factory, a series of systematic investigations were undertaken to set right certain defects in the processes.

3. *Introduction*.—Prior to my taking over charge, a number of defects had been noticed in malt extract and malt food produced at the Factory and there was a likelihood of their assuming much importance. The malt extract was often developing mould and causing serious loss and trouble. The only way of overcoming this appeared to lie in a critical study of the processes themselves. This was taken up quickly and systematically so that it became possible to produce malt extract of very good keeping quality. The results of these investigations are briefly described in the following paragraphs.

Malt Extract.

4. *Temperature of mashing*.—The couching room and the mashing tank are the two most important and vital steps in the preparation of malt extract. The cholam in stock was a mixed one and of fair germination capacity only. Although cholam of high germination capacity is necessary for the preparation of malt extract, the best use had to be made of the existing stock itself, as there was no likelihood of exchanging it for better quality cholam. Great care was taken to see that the grain was malted under standard conditions in the couching rooms. At a later stage even the standard method of couching adopted had to be slightly modified, preliminary investigations with high germination cholam having shown that the maximum amount of diastatic activity develops by about the 4th day and falls off gradually thereafter. It was, therefore, thought desirable not to prolong the couching period beyond the 6th day. This has since been adopted as a standard method for couching.

A start was made with the mashing process to find out if any improvement could be effected in the final extract. By keeping the temperature of the mash at 60-61°C and not allowing it to rise to such high temperatures as 65-67°C, the percentage of sugars in the final extract was considerably increased. This percentage ranged from 65-75 showing thereby that by accurate temperature control it is possible to get malt extract with high sugar content. When the temperature is increased to 65-67°C, there is less of sugar and more of malto-dextrins in the extract which may all the same appear to be thick and viscous giving a false idea about its keeping quality.

These extracts have a marked tendency to develop mould growth during storage under unfavourable conditions. When high temperature mashing is resorted to to show increased yields of extract, the extract is invariably cloudy with plenty of suspended starch, and in some cases it looks like a jelly. The sugar content of these extracts is very low, being about 40-45 per cent only and the taste is quite insipid. A series of further critical experiments have shown that in the case of Nandyal yellow cholam having 85-90 per cent germination, the diastase is highly sensitive to temperature, even a slight increase of about one to two degrees above 60°C leading to considerable deterioration in the extract as regards its sugar content. It is, therefore, very essential that strict control should be kept over the mashing temperature throughout the process. Any decrease in yield or percentage of sugars in the extract has always been traced back to improper control over the mashing process. Although this appears to be a simple process, much care and skill are needed in carrying it out successfully.

5. *Centrifuging and filtration of the dilute extract.*—After drawing out the supernatant liquid from the mash, the thick residue is passed through a centrifuge. Three centrifuges are required to deal with a single charge. The process is slow and takes nearly two hours for completion. The liquid cools down well below 60°C during the process with the result that a certain amount of acidity develops at this stage. This can be minimised by quickening the process by using an efficient filter press instead of the centrifuges. Preliminary experiments have shown the possibility of doing this.

The combined supernatant and centrifuged liquids are passed through a bed of active carbon on the perforated plate of a vacuum filter. It has been noticed that filtration of the liquid is very slow at 60-62°C and rapid at temperatures higher than 70-75°C. This is a serious handicap to the production of high quality malt extract with high diastase content, since diastase is easily destroyed at temperatures higher than 65-66°C. Filtration at 60-62°C with active carbon using a vacuum filter is prolonged and leads to much trouble. Quite often, the carbon bed breaks up and floats in the liquid rendering further filtration almost impossible. During prolonged filtering the liquid cools sufficiently for acidity to develop. Experiments with a filter press have shown that the centrifuge can be dispensed with and the dilute extract filtered satisfactorily even at 60°C without the use of any acting carbon. There are, however, some minor defects in the use of a filter press, and these are being set right. Meanwhile, as a routine process, the vacuum filter is in use, the liquid being heated to 70-75°C to facilitate filtration even at the risk of losing its diastatic activity. Diastatic activity in malt extract is an important factor, but the value of the extract depends mostly upon its sugars and nitrogenous factors. The high temperature filtration is, therefore, justified to some extent. Filtration of supernatant liquids separately from the centrifuged liquids showed that much of the extract is due to the centrifuged liquid portion. It is, therefore, not possible to discard the liquid in the thick mash.

The use of active carbon accounts for a fairly high percentage of the cost of production of malt extract. Experiments have shown that this cost can be reduced slightly by using reactivated carbon. The extract got by using reactivated carbon is not markedly different from that got using fresh carbon, although the time of filtration is slightly more in the former case. The possibility of effecting this economy in the use of active carbon is being further examined. It may, however, be mentioned that repeated trials have shown that the same carbon cannot be used to filter even two successive charges of dilute extract. One charge of carbon on the filter plate can deal with one charge of liquid only and this too when the filtration is continuous. When a second charge of filtrate is run on to the filter bed after the first charges has run through to completion or almost to completion, the carbon floats up and the second charge cannot be filtered at all. It is, therefore, necessary to change the carbon filter for every charge. This is a slow as well as costly process, but is all the same inevitable at present.

6. *Concentration in vacuo.*—After filtration, the filtrate which is clear and slightly greyish in colour, is charged into the vacuum pan. There are six of these in the factory. With the existing steam and vacuum installations, it takes nearly 25-30 hours for each charge to go to completion. The water-supply for the condensers is just sufficient for five pans only. When all the five pans are run simultaneously and the temperature maintained at 60-62°C to prevent the destruction of diastatic activity, the time taken is as much as 35-40 hours which is uneconomical. To get over this, the temperature of concentration has been increased to 69-70°C and by improving the working of the vacuum units, it has been possible to cut down the time to about 20-24 hours. The steam supply is a limiting factor and for any further increase in output it is necessary to have a bigger boiler or run simultaneously both the existing boilers, which is not desirable. This is being studied further.

7. *Analysis of extract.*—The large-scale plant started production from 24th November 1943. In January 1944 the monthly production was about 4,500 lb. of extract. This was partly due to the new machinery and partly due to higher yields, the extract having been drawn thin. In the long run, this led to trouble, most of the extract prepared developing fungus. This had to be avoided at all costs. In order to achieve this, systematic analysis of all the charges was taken up. The Zeiss refractometer was successfully employed to determine the total solids in the extract. It was observed that in order to have good keeping quality the final extract should have a refractive index of 1.4925 to 1.4950, which corresponds to about 81-83 per cent total solids. If the temperature of mashing is maintained at 60°C, these extracts are of thick and viscous consistency, have 65-70 per cent sugars and keep well in storage. When these conditions are satisfied, the yield of extract per charge is lowered. The monthly output of extract of good keeping quality is, therefore, low when compared with the reported outputs in the beginning.

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During the past several months the extract is drawn at the proper stage so that the yield per charge using 50 lb. of green malt and 50 lb. of roasted malt is about 25-28 lb. only against 45-50 lb. at the very beginning. It is necessary that attempts should not be made to increase this yield by drawing slightly thinner extract. If, however, it is proposed to preserve the extract by means of permitted preservatives, it will be possible to draw the extract at a slightly earlier stage of concentration so that the average yields per charge will be more than what they actually are at present.

8. *Stirring of the extract with shark liver oil.*—The extract drawn from the still is stirred with shark liver oil of high potency to give malt extract with shark liver oil having a vitamin A potency of about 200 international units per gram. A series of experiments have shown that some loss of vitamin A occurs during this process. During stirring, the temperature of the extract rises unless it is specially cooled. Recent work has shown that although temperature by itself might not lead to any considerable loss in vitamin A content, in the presence of air it might lead to big losses. It is, therefore, desirable to conduct stirring in an inert atmosphere like that of nitrogen to prevent vitamin losses. Under the standard conditions of stirring adopted in the factory using oil of about 15,000 international units per gram in one per cent strength in malt extract, the finished product was found to contain about 110 units only as against a theoretical value of 150 units. Arrangements have recently been made to study the effect of stirring in nitrogen gas on the vitamin losses in malt extract. This is a very important problem and the changes in vitamin A during storage and distribution require to be followed up. Preliminary studies in this direction have already been taken up.

9. *Bottling of malt extract.*—The final stage in the process of extract production, namely, bottling is a very important and critical step. It is essential that the containers should be perfectly clean and sterile and the extract filled under very clean conditions. Formerly, it was the practice to rinse the bottles in hot water, drain and allow to dry in the oven prior to filling the extract. This is not a satisfactory method. Arrangements were, therefore, made to sterilize the bottles in boiling water for 30 minutes, and dry them in a hot oven. The lids also were sterilized by dipping them in a muslin bag for five minutes in boiling water. Immediately after stirring with oil, the extract which was at about 50-55°C was heated to 60°C in a steam jacketed pan and filled directly into bottles. The bottles were closed with lids and when slightly cooled, they were dipped in melted paraffin wax so as to get a thick coating of it between the screw threads of the bottle and of the lid. This improved method of packing was adopted not only to keep the contents clean and prevent the access of dust, etc., into it, but also to safeguard against leakage in transit. By adopting this method it has been possible to cut down leakage losses to the barest minimum. The bottles used are not perfect as regards their air-tight sealing and the cardboard washers employed add to this defect.

Attempts have been made to secure rubber washers instead of cardboard washers so that leakage may be prevented altogether. Meanwhile, the paraffin sealing has proved useful to minimise the trouble, and to enhance the self-appearance of the bottle. To be doubly sure, the bottles are rewaxed after some time so that the seal may be perfect.

The alternative method of sterilizing the extract in the bottles which was in use previously was also studied. The extract was filled into bottles, closed tightly with lids and placed on the shelves inside an electrically heated oven. Heating of the bottles was not uniform. It took nearly seven to eight hours for the extract to attain a temperature of even 55°C. Bottles kept near the heaters warmed up quickly and some of them frothed over, while bottles on the bottom and top shelves never reached 45-50°C. This was not, therefore, satisfactory for sterilizing the bottled extract. Further, heating had to be done on three consecutive days so that the flow of the processes was held up unnecessarily. It was, therefore, decided to pack the extract "hot" so that there was uniformity in the method of packing. This, in addition to the already good keeping quality of the standard extracts being produced, has proved useful in overcoming spoilage due to mould. This is a definite and important advance in the technical process. Several thousand bottles of extract have been sent out with confidence, and the results have amply justified the soundness of the technique employed.

10. *Packing and despatch of the finished products.*—In the early stages, the bottled extract was wrapped in paper and packed in straw in packing cases for despatch to the consuming centres. Since the lids were not air-tight, and paraffin sealing was not adopted, dust and extraneous matter got into the bottles leading to subsequent spoilage. The extract that was packed was already dilute and likely to develop mould growth at any time. The method of packing only helped to increase this spoilage. Further, due to bad packing, there was much leakage of extract. There was loss of bottles due to pilferage also. These were minimised by adopting better packing methods and by sealing the cases before despatch. These have proved very effective. Special labels like "Glass with Care", "This side up" were also brought into use as a measure of safety.

11. *Filtration experiments.*—A series of filtration trials were carried out with a large filter press having 39 plates of 26 inches square. The filter cloth used was thick drill cloth. The liquid was fed into the press by means of electrically driven pump. When the press cloth was new, the first two or three charges filtered through rapidly, and the filtrate was quite clear. The extract also was of pale amber colour and very much like the usual run of extract got by using active carbon for filtration. To avoid clogging of the pipe line, it was found necessary to strain away the thick residue on a preliminary sieve and feed the strained liquid slowly while keeping it well stirred to prevent settling. The residue on the strainer contained much extract, some of which could be recovered by

washing twice or thrice with about six gallons of warm water. The adhering extract could not be removed completely even by pressing in cloth bag between the frames of the filter press. The yield of extract per charge was consequently low. A single piece of filter cloth was spread across the top of each plate so as to cover both sides of the plate and screwed at the centre. It was, therefore, very difficult to clean the plate as well as the cloth with the result that the press soon became a hot-bed of bacteria and the filtrate turned highly acid. The extract has as much as 3.0 per cent acidity as against a normal of 0.6 to 0.8 per cent only. This was a serious objection against the press. To get over this defect, the cloth was cut at the centre and tagged at the top of the plate so that both sides of the plate and of the filter cloth could be effectively cleaned and dried. Further, only 16 plates were used at a time so that, if necessary, the press could be used in two sections to facilitate cleaning and drying. The filter plates are of iron and rust easily between shut downs. The filter cloth also wears out quickly. The plates being heavy, it is difficult to handle and clean them properly. Although the first 25-30 gallons of liquid out of a total of 50 gallons filter through rapidly, the remaining portion trickles through slowly and filtration is not complete even after two hours. During this prolonged filtration, the liquid is likely to develop some acidity. This incomplete filtration is a disadvantage especially when five to six different charges are to be filtered every day. It is not desirable to use the press continuously without cleaning up between charges for fear of the filtrate becoming highly acid. It is proposed to get over this trouble by working the press in two sections which can be cleaned and worked alternately. Cleaning by steam under pressure is also desirable for effective sterilization of the plates *in situ*. Trials are in progress to find out a satisfactory working schedule for the filter press.

12. *Use of paddy malt.*—In order to find out if paddy malt could be used as green malt for extract production, a few trial charges were run. In one charge using 25 lb. good paddy green malt, 25 lb. cholam green malt and 50 lb. roasted cholam malt, the yield of extract was 22 lb. (sugars 73.98 per cent, acidity 0.71 per cent) and it was thick and of bright amber colour and had good taste and flavour. In another trial using 50 lb. paddy green malt and 50 lb. roasted cholam malt, the yield of extract was 33 lb. It was highly viscous and had good taste and flavour. It was of light amber colour and analysed for 67.4 per cent sugars and 1.04 per cent acidity. These trials indicate that paddy green malt is as effective as good cholam green malt for the production of malt extract and can be utilized when cholam of high germination capacity is not easily available.

13. *Use of starch from rice, sweet potato and tapioca.*—A series of experiments were carried out to find out the possibility of utilizing for malt extract production starch other than from cholam. Rice flour, sweet potato and tapioca flours were tried. The green malt from cholam was employed as the source of diastase. Using 25 lb.

sweet potato powder (sun dried) and 50 lb. of cholam green malt the yield of extract was 26 lb. (sugars as maltose 50.8 per cent; acidity 0.90 per cent). There was nothing unusual about this extract in appearance and taste. In the case of rice flour which was obtained from broken rice, 25 lb. of the flour were gelatinized with 20 gallons of water at 80-85°C, cooled to 60°C and 2½ lb. of cholam green malt added in 10 gallons of water at 60°C. The mashing was for two hours only. The yield of extract was 17 lb. The extract was greyish white and gelatinous unlike the normal extract which is highly viscous and amber coloured, and had a tendency to drop off in flakes (sugars 69.72 per cent; acidity 0.41 per cent). In another trial, 25 lb. rice flour was mixed with 5 lb. of cholam green malt and stirred in with 10 gallons of warm water. When well stirred in, another 10 gallons of water were added and the temperature raised to 80°C with constant stirring to gelatinize the starch (30 minutes). It was then cooled to 60°C and a mash of 45 lb. cholam green malt and 25 lb. roasted cholam malt in 20 gallons of water at 60°C was added to it. Mashing was completed as usual. The yield of extract was 44 lb. (Total solids 83.3 per cent; sugars as maltose 80.54 per cent; acidity of 0.78 per cent.) The extract was of amber colour, thick in consistency and had good taste and flavour. This experiment shows that replacing a certain portion of the cholam malt by means of extraneous starch such as that from rice flour leads to higher yields. This is an important observation. The preliminary digestion of the rice flour with a small quantity of green malt during gelatinization of the starch facilitates rapid filtration of the mash liquid through active carbon. Plenty of undigested starch in the mash renders filtration difficult.

Using 50 lb. of sliced fresh tapioca root which had been boiled in two charges of water to remove the bitter principle and gelatinizing in about 20 gallons of water and taking 10 lb. of cholam green malt the extract obtained was 2 lb. only. It was thick and had a saltish taste. Further experiments using undried tapioca flour will be carried out on the same lines as rice flour to find out the possibility of utilizing tapioca for malt extract production. For this kind of work green malt of high diastatic activity such as barley is preferable.

14. *Preparation of extract from mash residue.*—To find out how much of extract could be recovered by remashing the residue from the first mash, the residue from the centrifuge was remashed at 62°C with 10 lb. of fresh cholam green malt with 30 gallons of water for two hours, centrifuged, filtered and concentrated. The yield of extract was 10 lb. (sugars 40.52 per cent; acidity 0.29 per cent). It was slightly opaque and greyish in colour. The 10 lb. of green malt added could not by itself be expected to yield more than about 3 lb. of extract. It is, therefore, evident that about 7 lb. of extract could be got from the mash residue from the normal charge. This is a fairly good recovery, but the processes involved such as centrifuging, filtering, etc., are the same as for a normal

charge. Any attempt to realize this extra yield interferes with normal production with the existing equipment. It may, however, be possible to recover a portion of this by dispensing with centrifuging, and only filtering whatever liquid can be drawn off by decantation. This also, however, requires extra steam and separate vacuum pans both of which are limiting factors. The recovery through secondary mashing can be profitably undertaken only when there is a plentiful supply of steam.

15. *Preparation of extract from cholam stored in silo.*—During storage in bags the cholam grain slowly deteriorates in its germination capacity. Cholam which does not germinate well during couching, especially the pitted stock, gives much trouble during filtration and the yield of extract is low. Cholam of high germination capacity is, therefore, essential for smooth processing and high yield of extract of excellent quality. Although silo storage has been found quite suitable for bulk storage of foodgrains, it was noticed that in the case of Periyamanjal cholam which had been stored for one year in a silo, the germination capacity was very low, being about 6 per cent only. This could not, therefore, be utilized by itself for extract production. When the green malt from Nandyal cholam which had 85-90 per cent germination was used as a source of diastase, the silo cholam malt being used as roasted malt only, the yields of extract were normal and the analytical figures (sugars 63.10 per cent; acidity 0.68 per cent) did not show any marked variations from the normal. This shows the possibility of utilizing even cholam of poor germination provided good green malt is available to serve as the main source of diastase.

16. *Reprocessing of fungus attacked extract.*—A considerable portion of malt extract which had been packed during 1944 had gone mouldy. Records showed that the yields during this period were abnormally high, being about 50-55 lb. per charge. Although the extracts appeared to be fairly thick in consistency, they were very low in sugars (38-40 per cent only) and slightly opaque, having been most probably prepared by adopting very high mashing temperatures. These dilute high-temperature extracts naturally developed mould growth during storage. In order to recover these, they were reprocessed. After removing any fungus mat on the top, the extract was collected in a drum and steamed on two successive days by passing in steam directly into the extract. This intermittent sterilization was resorted to in order to destroy any fungal spores in the extract. The dilute extract was fed into the still and concentrated. The percentage of recovery was about 85-90 per cent only. The extract was stirred with fresh shark liver oil, bottled by the "hot" method, the bottles waxed and stored. The reprocessed extract packed by the improved method has kept well for several months. Arrangements have been made to get it tested for suitability for human consumption. It is presumed that mould growth is harmless as in the case of jams and jellies which are often repacked whenever there is any tendency for developing mould growth.

17. *Malt food.*—The production of malt food was low due to the fact that most of the machinery was put up as late as March 1945 and that the older units were under frequent repairs. The new transformer was brought into use in January 1945. The method recommended for packing malt food was to pack it in CO₂ gas and seal the bottle with paraffin wax. A large number of trials have, however, shown that the CO₂ retention inside the bottle is often low after a few days storage. For effective destruction of all stages of the weevil including eggs and grubs, the minimum CO₂ percentage inside the bottle should be about 25 per cent. Under actual factory conditions in spite of effecting considerable improvements in the efficacy of the CO₂ packing apparatus, this optimum concentration of CO₂ inside the bottle is not always attained. This is a serious thing in view of the possibility of some stage or other of the weevil becoming active due to low concentration of CO₂ inside the bottle after some days storage. So long as it is not possible to fix any definite "safety" period for preliminary storage of the bottled food beyond which no insect life can develop inside the bottle, it will be impossible to release the food for wider scale with confidence. It is feared that CO₂ packing alone may not be a cent per cent success against any possibility of insect attack during long storage. A series of trials have, therefore, been carried out to find out the effect of pre-treatment with heat prior to packing in CO₂ gas. Experiments, have, however, shown that it is very difficult to heat the bottled food uniformly at about 55 ° C. To secure uniform heating, the loose food is spread in a thin layer and heated for 10 minutes at 60 ° C. During this heating, all stages of insect life are destroyed. After this treatment, the food is packed hot into clean bottles, and when sufficiently cooled, the bottles are sealed in CO₂ gas using paraffin wax to prevent the escape of CO₂ gas. The paraffin sealing has been recently improved so that it acts as an effective seal against the escape of gas. It is hoped that this doubly precautionary measure of packing might prevent troubles due to insect attack in bottled malt food. The heat treatment also helps to pack the food in a drier and more flowing powder form. The possibility of the food going rancid or tallow after long storage still exists. Definite preventive measures against this kind of spoilage have not yet been developed. This requires concentrated and long range research in a well equipped chemical laboratory and cannot be done at the factory just now. Meanwhile, the safest procedure would be to dispose of the stocks then and there and not allow them to build up to any large extent.

The production of malt food is essentially a mechanical process and the monthly output depends entirely upon the working efficiency of the mechanical equipment. Much trouble and delay have been experienced in the proper running of several of the units. The grinders wear out quickly and become useless. The polishers break down frequently. The sieves have all worn out and require constant repairs and it has not been possible to secure the 100 mesh brass sieve that is required for replacing the old sieves. In spite of these

and other disadvantages, the production of malt food has been kept up at some rate so that the work might be continuous and definite data might be collected regarding the keeping quality of the product. The production of malt food should be increased only when there is an assured demand for the product so that it might be disposed of as quickly as it is produced. This is all the more important in view of the fact that although insect spoilage might be prevented by the improved methods of packing, the possibility of the food developing rancidity during long storage still exists. This kind of spoilage is inherent to the food on account of its high fat content. Special investigations are required to evolve fairly satisfactory methods to prevent this kind of spoilage in malt food.

Periyamanjal cholam of high germination capacity gives malt food of very good flavour. If the germination percentage is low, the malt develops an oily flavour during roasting. Yellow cholam from Kurnool district has been found to take much longer time than Periyamanjal cholam for polishing. Preliminary partial roasting of the green malt does not decrease considerably the time taken for polishing. The percentage yield of malt food is increased considerably by using 80 mesh instead of 100 mesh sieves. The resulting powder is quite fine and smooth in texture. The use of 100 mesh sieve leads to the removal of nearly 60 per cent of the ground roasted malt as coarse malt. In the case of 80 mesh sieve, about 35 per cent only is removed as coarse malt. Analytical studies are in progress to find out if the quality of the food produced is in any way adversely affected by the use of 80 mesh sieves.

18. *Raw materials.*—Due to the abnormal prevailing condition, much difficulty was experienced in getting the raw materials. Bottles for extract were supplied as usual by the Mysore Glass and Enamel Works. Fresh cholam of high germination capacity had to be got from Kurnool district, the cholam crop in Coimbatore district being a total failure. The supply of fuel was not quite smooth and the factory had to stop working for a few days for want of fuel. Charcoal for roasting the malt was available locally. Shark liver oil was got in lots of 8 gallons and tested for vitamin A content. Gallon tins for packing malt extract for the Medical Directorate were supplied by the Medical Directorate itself. A large number of cholam samples were tested for their germination capacity and purchases were made on the basis of these tests. A stock of packing cases, paraffin wax, cardboard washers, labels, etc., was built up by careful planning well in time. The old stock of cholam which had deteriorated in germination capacity was disposed of by sale. Since cholam should not be stored inside the factory in close proximity to the finished products, it is necessary to have a store room for cholam bags and it should be possible to fumigate the stock *in situ* against weevil attack of the grain.

19. *Machinery and equipment.*—Additional machinery and equipment for the malt food and malt extract sections were installed during the year. Much care and energy were needed to get the

units into working order. For the smooth and efficient working of the units it is imperative that all running repairs should be promptly attended to. Delay in these for some reason or other often led to discontinuity in production. The two large couching rooms were completed during the year so that it is now possible to malt about 2,00 lb. of cholam every day. Centrifuges, vacuum stills and stirrers were all overhauled for smoother working. The vacuum pumps had to be repaired very often so that only two of the four could be worked at a time.

20. *Water-supply.*—The present water-supply is not sufficient to run all the six condensers and the vacuum pumps. This limiting factor has rendered difficult the running of all the six vacuum stills simultaneously. A large storage tank at a higher level or a separate pumping unit to circulate the condenser water will overcome this difficulty. For the boiler and the extract plant water has to be fetched from a distant well in cart. This water requires boiling and cooling to render it safe for extraction work. Further, much labour is wasted in fetching this water and distributing it to different points in the factory. The cost involved is also high. A plentiful supply of good quality water would naturally lead to better production and lessening of the costs.

21. *Distribution and sale of products.*—The sale of malt food by the agent which started only towards the end of the year is increasing slowly. Nearly 3,000 lb. of malt food were supplied to famine camps in Visakhapatnam district. The provincial Co-operative Marketing Society were the sole agents for malt extract. There was considerable demand for plain extract by pharmaceutical firms all over India. It has not been possible to meet all these demands on account of existing orders for the extract with shark liver oil. The extract produced by the improved method appears to have an appreciative market which is fairly wide. The prices of malt food and malt extract were Rs. 2-4-0 and Rs. 4 per pound throughout the year. On account of the increase in the cost of raw materials, labour, etc., it has since been found necessary to work out the actual cost of production and revise the present sale prices. The sale prices are high and every possible step is being taken to reduce it without affecting the quality of the product. Depreciation on machinery and buildings, and interest on capital account for nearly 25 per cent of this cost. The possibility of lowering the cost through reduction of some of the non-essential items and more efficient use of existing men and machinery has been investigated in some detail. This has been drawn upon already to a considerable extent. Any further reduction in cost will depend mostly upon the working efficiency of the equipment. Constant efforts have been and are being made to effect this.

22. *Supervision and control.*—Constant supervision and control were maintained over all the processes of manufacture. The technical and business aspects of the work were systematized to a great extent so that the work could proceed smoothly on the basis

of accurate records. Samples of charges were analysed at regular intervals to keep scientific control over the standardization of the products manufactured. Accounts, stock books and process records were brought up to date and maintained properly. All these involved much careful planning and diligent execution. The accounts of the factory were audited during June 1945. Now that a stage has been reached when the products can be manufactured and released for sale with confidence, it is proposed to take steps to increase the output and explore the possibility of a better business organization to push up sales.

23. *Teaching*.—One student from the Punjab Agricultural College, Lyallpur, was trained for one month in malt making.

24. *Visitors*.—A large number of persons including Government officials, businessmen, capitalists, industrialists and laymen visited the Factory. The Malt Factory is a centre of attraction for the people passing through Coimbatore and the staff has tried its best to take round and explain the work to all these visitors.

FINANCIAL STATEMENT FOR THE YEAR 1944-45.

(For the Fasli year 1st July 1944 to 30th June 1945.)

85. *A. Capital outlay on provincial schemes connected with the war 1939—C. Other miscellaneous schemes—E. Production and sale of malted products.*

Particulars.	Amount.		
	RS.	A.	P.
1 Pay of officers	1,332	0	0
2 Pay of Establishment	4,683	10	0
3 Dearness allowance	1,601	1	0
4 Travelling allowance	71	10	0
5 Plant and machinery	17,445	13	1
6 Stores and materials	95,060	12	11
7 Freight and cartage	1,601	15	9
8 Other charges	13,988	2	9
9 Petty construction and repairs	17,830	9	3
Total expenditure	1,53,585	10	9
<i>E. 4. Deduct—Receipts and recoveries on capital account—</i>			
1 Sale to public	60,872	0	5
2 Other receipts	24,524	8	1
Total receipts	85,396	8	6

NOTE.—Remittance from sole agents—The Madras Provincial Co-operative Marketing Society, Limited, Madras and Messrs. Best and Company, Limited, Madras—are expected once in a way only.

COIMBATORE,
2nd August 1945.

G. S. SIDDAPPA,
Biochemist-in-charge.

ADMINISTRATION REPORT OF THE PROVINCIAL MARKETING OFFICER, MADRAS, FOR THE YEAR 1944-45 (FASLI 1353).

I submit herewith the administration report for the year 1944-45 (Fasli 1353).

Staff.—I was in charge of the section throughout the year. Assistant Marketing Officer, Sri M. P. Kunhikutti, was in charge of the post of Assistant Marketing Officer till 31st December 1944, when he went on leave for two months from 1st January 1945 and rejoined duty on 1st March 1945. During his absence on leave, Sri V. Satagopan officiated for him till 1st March 1945 when he was transferred as District Agricultural Officer, Kurnool.

Assistant Marketing Officer, Sri A. Chidambaram Pillai, was in charge throughout the year excepting for eleven days from 2nd to 12th May 1945 when he took leave on average pay.

Assistant Marketing Officer, Sri D. V. Reddy, continued to be in charge during the year.

Sri T. K. Thangavelu, Assistant Marketing Officer (Jaggery), and the staff were transferred under the control of the Commissioner of Civil Supplies with effect from 1st November 1944 in G.O. Ms. No. 4540, Development, dated 24th October 1944.

Assistant Marketing Officer (Rice Grading).—Sri V. Satagopan, Assistant Marketing Officer, was in charge of the Rice Grading Scheme till 31st December 1944 when the Assistant Marketing Officer (Rice Grading) and the staff of eight Marketing Assistants were disbanded with effect from 5th January 1945 according to Board's letter R.C. No. 3820/44-3-G.3-C.S., dated 4th January 1945.

Assistant Marketing Officers (Special Survey).—Messrs. A. Mohammad Ali, A. M. Muthayya Nattar and M. Gopala Chetty were posted as Assistant Marketing Officers in the Special Survey Scheme sanctioned in G.O. Ms. No. 3742, Development, dated 31st August 1944 for five months from the date of appointment for carrying out a detailed survey of the quantity, quality, prices, sources of supply of certain minor articles of food stuffs such as vegetables, cattle, sheep, goats, fish, fowls, eggs, meat, and other livestock products. They joined duty on 25th September 1944. The scheme was further extended for two months and six days from 25th February to 30th April 1945 in G.O. Ms. No. 807, Development, dated 28th February 1945 when the three Assistant Marketing Officers and staff were disbanded.

Assistant Marketing Officer (Rice Milling).—In G.O. Ms. No. 2105, Development, dated 15th October 1944, one Marketing Assistant was sanctioned for work connected with the Rice Milling

Licensing Order and this was further extended up to 31st March 1946. In G.O. Ms. No. 1824, Development, dated 5th May 1945, one Assistant Marketing Officer for Rice Milling was sanctioned to have efficient supervision of the several mills in the different districts of the Province not under the control of the Grain Purchase Officers.

Staff.—The posts of six Marketing Assistants were further extended for another year till 31st March 1946. The posts of six Recorders were sanctioned till 30th September 1945. Except the Marketing Assistant and Recorder at Madras, the other five Marketing Assistants and five Recorders continued to work under the Grain Purchase Officers.

Jaggery Purchase Scheme.—Out of five Marketing Assistants sanctioned in G.O. Ms. No. 540, Development, dated 8th February 1944, three Marketing Assistants and staff of one upper division clerk and two lower division clerks, were disbanded with effect from 1st November 1944 according to Board's Order No. 1664-C-2/44, dated 18th October 1944. The remaining staff were transferred under the control of the Commissioner of Civil Supplies.

Rice Grading Scheme.—The staff of eight Marketing Assistants who were working in the scheme of quality grading of rice were disbanded with effect from 1st January 1945.

Special Survey Scheme.—Six Marketing Assistants and ministerial staff sanctioned for the special survey scheme continued till 30th April 1945.

Rice Milling Scheme.—Besides the sanction for the continuance of one Marketing Assistant for one more year at Madras sanctioned in G.O. No. 2105, Development, dated 15th May 1944, three more Marketing Assistants were sanctioned with headquarters at Madras, Madura and Coimbatore. These Marketing Assistants joined duty only at their headquarters in May and June 1945.

2. *Market Surveys.*—The market survey reports for the Madras Presidency on chillies and meat were sent on completion to the Agricultural Marketing Adviser to the Government of India and Director of Agriculture. The survey reports on millets, pulses and table poultry are nearing completion, while those on gingelly and niger seed are in progress. With the publication of the All-India reports on lac, sugar, skins, and markets and fairs, the corresponding provincial reports have been revised and submitted to the Director of Agriculture. Supplementary information was sent to Agricultural Marketing Adviser to the Government of India on the following reports, viz., mangoes, fibres, meat, wheat and millets.

Special Surveys for the Defence Services.—As required by the Board of Revenue, special rapid survey reports for use of the defence services were prepared on the following, namely, poultry, eggs, sheep and goats and fish. These have since been arranged for printing. Besides, as required by the Revenue Board, and in connexion with

the enquiry by the Food Department of the Government of India, data were compiled for the whole province on the production, consumption, imports, exports, prices, etc., of different protective foods and necessary commodities, and submitted in one volume for the following articles, namely, eggs, poultry, milk and milk products, livestock, sheep and goats, oil seeds and cakes, cooking oils, fresh fruits and vegetables. The Agricultural Marketing Adviser to the Government of India was supplied information for a rapid survey of cardamum and minor fibres.

3. *Developmental work—Grading of commodities—(a) Rice.*—The grading of rice under war quality specifications continued until December 1944 when the scheme was closed. The quantity of rice graded from the inception of rice grading in the Presidency were as follows :—

Quantity of rice graded in the Madras Presidency.

		Quantity in railway maunds.	Value. RS.
1938-39	.. ..	26,320	1,05,000
1939-40	.. ..	126,970	5,50,940
1940-41	.. ..	245,700	12,68,340
1941-42	.. ..	257,060	15,04,400
1942-43	.. ..	88,230	5,61,820
1943-44	.. ..	182,370	15,95,800
1944-45	.. ..	70,220	6,00,370
(Six months, July to December 1944).			
		996,870	61,86,670

At the end of 1944, the Board of Revenue approved of a scheme to purchase rice under standard specifications prescribed for boiled and raw rices, with cuts to be imposed according to deviations from the prescribed standard. This was brought into force from the 1945 season and had a pronounced effect in improving the quality of rice delivered by the mills and keeping them reasonably up to standards prescribed.

(b) *Citrus fruits.*—Sathgudi oranges numbering 944,156 fruits, valued at Rs. 1.14 lakhs, were graded during the year at Madras and Koduru through Co-operative Societies. The Co-operative Societies at Kilakadayam and Palakol (West Godavari) graded together 501,510 lime fruits, valued at Rs. 4,350. The Marthi's Fruit Products graded 744 gallons of citrus juice, valued at Rs. 6,494.

(c) *Grading of eggs* continued in Ootacamund, Katpadi and Ongole and Madras, and 23 lakhs of eggs, valued at 2.62 lakhs of rupees, were graded during the year.

(d) *Other commodities.*—Grading of cigarette tobacco in Guntur was withheld until the appointment of Special staff of a Chief Inspector and subordinate to certify quality of tobacco in exports. They joined duty in May 1945 and are now certifying quality of tobacco exported to the Middle East. For exports to United Kingdom, the Indian Tobacco Association is continuing to certify quality under arrangements made by the London Chamber of Commerce. The allocation of certification of tobacco between these two agencies is under consideration by the Government of India.

Other commodities are not being graded in this Presidency at present.

Since the inception of grading in this province produce to the value of about 96 lakhs of rupees have been graded under 'Agmark' standards. Of this, rice accounted for the largest share, namely, 36,600 tons, valued at Rs. 62 lakhs of rupees.

4. *Work done through co-operative societies.*—Close touch was maintained with the Registrar of Co-operative Societies, Joint Registrar of Co-operative Societies and officers of the Co-operative department in the districts. Enquiries received from co-operative societies, co-operative stores, marketing societies, etc., were attended to. The Palakol Fruit Growers' Society was helped to get transport facilities for export of limes to Bengal. Meetings of the Provincial Marketing Society at Madras were attended and help rendered. Besides the help of grading oranges, eggs and limes to societies at Madras, Kodur, Katpadi, Palakol and Kilakadayam, information was supplied to several co-operatives regarding sources of supply, prices, availability of essential articles. Besides, proposals and schemes in respect of the following items were discussed with the Registrar of Co-operative Societies and reports submitted—

- (1) Crushing groundnuts and refining of groundnut oil by co-operative societies.
- (2) Sale of groundnuts by co-operative societies in regulated markets.
- (3) Starting of a Co-operative society of growers for tobacco in Guntur district.
- (4) Supply of gingelly and cotton seed to co-operative societies.
- (5) Sources of supply and availability of food grains, oil seeds, oil and fruits, etc., to co-operative stores.
- (6) Marketing of long stapled cotton through co-operative societies.

In G.O. No. 1043, Development, dated 14th March 1945, Government were pleased to order that the market yards under the control of the Groundnut Market Committee, South Arcot, may be allowed for transactions of co-operative societies in the district.

5. *Regulated markets.*—During the year under report five market committees continued to function, namely, Cuddalore (groundnut); Guntur (tobacco); Tiruppur, Nandyal and Adoni (Cotton); while the Tobacco Committee at Bezwada was administered by a Special Officer working under the Collector.

Adoni.—The Adoni Market Committee did useful work in the control and regularization of the market. Eight meetings were held and opening rates were fixed by a system of auction, while 711 weights were checked and 93 stamped, and market information supplied. The Committee will be completing the construction of a market yard by the end of this year.

Tiruppur.—The Tiruppur Cotton Committee held 15 meetings in the year, and constructed three blocks of godowns. One thousand three hundred and twenty-four weights were checked and market information supplied. The transactions in the yard were small (5,126 bales). The Committee also completed arrangements for fixing standard samples and forms of contract.

Nandyal.—The Nandyal Committee held 14 meetings in the year and continued work of acquisition of a yard, and propaganda for better cultivation and marketing.

Cuddalore.—The Groundnut Market Committee, Cuddalore, held nine meetings in the year and operated market yards in seven centres and sub-centres in five places. Transactions in the yards totalled 31,794 tons representing 43.3 per cent of the total in the district. The gain to sellers, mostly ryots, is estimated at Rs. 1.8 lakhs. Prices at the yards were higher than outside and the committee's work was of outstanding use to sellers and buyers in the district.

Guntur.—Nine meetings were held by the tobacco market Committee, Guntur. The Committee is awaiting the issue of a public bonded warehouse licence for transactions in the yard. The committee published a monthly Telugu bulletin giving market information and attended to the control of weights, scales and market charges.

6. *Market intelligence.*—Periodical market information particularly prices were sent to a number of Government departments. Weekly reports of arrivals, stocks and prices of cattle at Tiruvottiyur were sent to the Commissioner of Civil Supplies and weekly prices of major commodities in Madras City and potatoes at Mettupalayam. The Agricultural Marketing Adviser to the Government of India was furnished information on weekly prices of potatoes, poultry and eggs in Madras City and fortnightly prices of Cotton Kapas in important markets. Fortnightly prices of English vegetables were supplied to the Director of Agriculture, Madras, and weekly arrivals and prices of sugar to the Commissioner of Police and Collector, Madras City. Monthly prices of groundnut oil and Coconut oil were furnished to soap factories and the Chief Controller of Purchase, New Delhi.

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Besides information was supplied to growers, Co-operative societies, Railway authorities and other departments of Government from time to time. A monthly review of prices was submitted to the Director of Agriculture.

7. *Collection and analysis of samples.*—In connexion with the proposals for fixing grade standards for ghee, 18 samples from six different ghee-producing areas of ghee prepared under supervision were sent to the Government Analyst, Guindy, Deputy Public Analyst, United Provinces, and the Director of Dairy Research, Bangalore. The latter was also supplied with samples of different oils and of different kinds of fat for determining the composition and nutritive value. Forty-one samples of different kinds of millets from important districts were sent to the Agricultural Marketing Adviser to the Government of India, Delhi, for quality analysis.

8. *Work done in co-operation with other departments—(a) Civil supplies.*—In addition to the rapid survey of essential food-stuffs and the preparation of data on important commodities for the food conference already referred to, close touch was maintained with the Civil Supplies department in the control of quality of rice and in supplying information on a number of commodities relating to civil supplies. For the equitable distribution of controlled commodities zonal schemes were drawn up to arrange the movements suitably for onions, edible oils, cotton seed and poultry. Data were supplied regarding the interprovincial trade in minor commodities as eggs, poultry, jaggery, etc.

(b) *Industries.*—The Director of Industries and Commerce was interviewed every month, and information supplied on a number of subjects as consumption, and production of oils, vegetable ghee, possibilities of running refrigerating plants, marketing of fish, and installation of oil mills and vegetable product factories, on a regional basis.

(c) *Co-operation.*—The work done in co-operation with the Co-operative department has already been detailed under Co-operative Societies.

(d) *Veterinary.*—The Director of Veterinary Services was furnished from time to time information about production, movements, interprovincial trade and expansion of the marketing of livestock and livestock products as poultry, eggs sheep and goats, cattle, etc.

9. *Special Schemes—(a) Madras Rice Mills Licensing Order.*—The Rice Mills Licensing Order continued to be in force and a Marketing Assistant continued under me, compiling data of mills and inspecting mills. Monthly reviews were sent to the Revenue Board of the outturn of rice to paddy and the degree of saving effected by the operation of the Rice Mills Licensing Order. The Marketing Assistant supervised the milling of rice in the districts

of Visakhapatnam, Chingleput, North Arcot, Coimbatore, Ramnad and Mathurai, and gave advice to millers to maintain the correct degree of polish and improve quality. From June onwards an Assistant Marketing Officer at Madras and three Marketing Assistants one each at Madras, Coimbatore and Mathurai were sanctioned to cope with the increased work. During the year under report, 31,766 milling returns were received, as against 60,137 due (or 52 per cent). From these returns it was found that 44,910,502 railway maunds of rice were recovered from 60,035,614 railway maunds of paddy or a ratio of rice to paddy of 69.8 per cent. This would roughly give an increase of 2.8 per cent higher outturn than in the normal pre-war period. The value of this outturn is roughly estimated to give 60,600 tons of rice in the rice output valued at about Rs. 150 lakhs of rupees.

In order to improve the quality, the Revenue Board also introduced a system of payment for rice according to quality, by imposing cuts, according to deviations from the standard. A number of samples of rice from different districts were analysed in this connexion. The quality of rice has materially improved after the introduction of the civil supplies standards for rice during 1945.

(b) *Scheme for the quality grading of South Indian citrus fruits.*—This scheme was meant to test the sweetness of oranges according to the sugar acid ratio, and to investigate its practical application to grading work. The scheme was transferred to the Provincial Marketing Officer from July 1944; comprising one Assistant and staff. Tests were made of the variations in sweetness of oranges in individual trees, as well as in bulk. The opinion of the public was also consulted regarding the grading. It was found that the sweetness of the fruits increased from July to February and that up to November it is not possible to correctly grade fruits due to the presence of sour and sweet fruits in the bulks. After November, fruits can be graded into sweet or medium taste, with a fair degree of reliability.

(c) *Jaggery purchase scheme.*—The scheme sanctioned through the Civil Supplies department for the purchase of cane-jaggery from surplus districts and export to other provinces and States, which was commenced in March 1944, continued under my control till October 1944. An Assistant Marketing Officer at Madras and Marketing Assistants in Anakapalle, Peddapur, Vellore, Kodumudi and Hospet were employed for the purchase. Exports were made according to quotas fixed for each province from each district and under ceiling price fixed for each zone for different qualities based on costs of production. In the beginning exports were made to nominees of other provinces, but due to delay in payment and consequent slowness, Government ordered exports by local merchants to their own nominees in the allotted provinces. This hastened the progress of work, although complaints were

received from other provinces as Cochin, Nizam's State, Central Provinces and Orissa. Altogether 20,895 tons of jaggery were exported to other provinces up to end of October 1944, when the staff were transferred to the control of Commissioner of Civil Supplies.

10. *Meetings and Conferences.*—The following meetings were attended by Provincial Marketing Officer :—

(1) Four meetings of the Provincial sub-committee of the co-ordinating committee for foodstuffs.

(2) Three meetings of the South Indian Railway advisory committee.

(3) Three meetings of the Madras and Southern Mahratta Railway advisory committee.

(4) Two meetings of the Board of Director of the Provincial Marketing Society.

(5) A meeting of the All-India Groundnut Conference and another of the Oil-Seeds Conference at Bombay in August 1944.

(6) A conference of district work officers at Coimbatore.

(7) Two meetings of the Provincial Cotton Committee at Madras.

11. *Work connected with the War.*—Besides the schemes for control of quality of rice exports of jaggery, rapid surveys of essential commodities, zonal schemes for movements which are all connected with the war conditions help was given to other departments in the supply of information and market conditions under emergency conditions. Detailed notes were prepared for the meetings of the interregional committee of the co-ordinating committee of foodstuffs. Proposals were submitted for arrangements and sources of supplies of eggs, meat, cattle, etc., for the defence services, and for the fixation of suitable ceiling prices for the commodities. The Controller of Supplies (Madras) was furnished information regarding the sources of supply of tamarind seed and prices. A scheme for the purchase and grading of potatoes at Nilgiris was submitted to the Director of Agriculture. Help was given to exporters of cotton in Ceded districts to get into touch with importers of cotton in other provinces.

12. *Grow More Food Campaign.*—Proposals were submitted to the Director of Agriculture for fixing targets for increase of food production and for expanding the area under pulses. Propaganda was done for the promotion of the Grow More Food Campaign. Monthly review of prices were furnished to the Director of Agriculture in connexion with the Grow More Food Journal. Notes were submitted in regard to the prospects of increased food production through irrigation, manuring and other methods.

13. *Post-war work.*—Proposals were sent up to the Director of Agriculture in regard to the fixation of a remunerative price for paddy, to meet the competition with foreign imported rice in the

post-war period. Notes were proposed for the All-India price committee for post-war stabilization of prices. Schemes were sent up for the expansion of the oil-seed industry and expansion of crushing; and manufacture of vegetable ghee.

14. The programme of work for 1945-46 has already been submitted to the Director of Agriculture in my letter No. B.-678/45, dated 8th June 1945.

15. *Financial statement.*—The appended statement shows the budget allotment and the amount expended during the fasli year (1944-45).

MADRAS,
13th August 1945.

S. N. VENKATARAMAN,
Provincial Marketing Officer.

FINANCIAL STATEMENT FOR THE YEAR 1944-45.

The following shows the amount expended in the year 1944-45 from 1st July 1944 to 30th June 1945 :—

I. Funds provided by the Imperial Council of Agricultural Research (B. Marketing Scheme)—

(1) Receipts.—Nil.

(2) Expenditure—

Head of account.	Budget allotment in 1944-45.	Expenditure from 1st July 1944 to 30th March 1945.	Expenditure for three months from 1st April to 30th June 1945.
40. h. Agriculture.			
B. Marketing Scheme.			
1 Pay of officers and establishment	15,100	13,140	4,903
2 Allowances	9,000	8,547	2,905
3 Dearness allowance	3,700	2,462	1,892
4 Contingencies	1,200	278	61
Total	29,000	24,427	8,861
A. Direction.			
I Pay of officers	11,500	8,545	2,715
II Pay of establishment	4,600	3,607	1,341
III Allowances	6,300	5,165	1,056
IV Dearness allowance	2,400	2,058	1,359
V Contingencies	1,300	1,339	510
VI Service postage	1,400	1,150	300
Total	27,500	21,864	7,281

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, VIZAGAPATAM, FOR FASLI 1354 (i.e., FROM 1ST JULY 1944 TO 30TH JUNE 1945).

Staff.—The Vizagapatam circle comprising North Vizagapatam, South Vizagapatam, East Godavari and West Godavari districts, was formed with effect from 1st February 1945. Prior to that, it was under the control of the Deputy Director of Agriculture, Northern Division, who had his headquarters at Guntur. I took charge on 1st February 1945.

During the fasli under review the districts were in charge of the following officers :—

(a) *North Vizagapatam.*—Janab Md. Khasim Adeni Sahib Bahadur was in charge during the entire period.

(b) *South Vizagapatam.*—Sri S. Sitarama Patrudu was in charge from 1st July 1944 to 6th July 1944. He was succeeded by Sri M. Satyanarayanamurthi, who continued to be in charge during the rest of the period.

(c) *East Godavari.*—Sri V. Achutharamiah was in charge during the entire period.

(d) *West Godavari.*—Sri P. A. Venkateswaran was in charge during the entire period.

In East Godavari district, a Gazetted Assistant was specially posted to be in charge of Takkavi loan distribution work with effect from 1st July 1944. The post was first held by Sri M. Satyanarayana and subsequently by Sri A. Muttiah Nattar.

In November 1944, the post of Personal Assistant was sanctioned for each District Agricultural Officer, to relieve him from routine office work and enable him to tour more extensively to supervise "Grow More Food" schemes.

From 1st April 1945, the jurisdiction of the District Agricultural Officers of North and South Vizagapatam was fixed as shown below :—

North Vizagapatam. (Headquarters—Chicacole).	South Vizagapatam. (Headquarters—Anakapalli).
Ichapur, Sompeta, Tekkali, Patapatnam, Narasaunapeta, Chicacole, Palakonda, Parvatipur, Bobbili and Salur taluks.	Vizianagaram, Vizagapatam, Chipurupalli, Bimlipatam, Anakapalli, Srungavarapukota, Sarvasiddhi, Golconda, Veeravalli and Gudem Agency taluks.

The Headquarters of the District Agricultural Officer, South Vizagapatam, was moved to Anakapalli in December 1944, due to dearth of accommodation at Vizagapatam.

2. *Agricultural Education.*—In the Agricultural Research Station Samalkot, the juvenile and adult labourers' school was continued. At the beginning of the fasli, the strength was 20 juvenile and 13 adult labourers and at the end of the period it was 25 and 13, respectively.

Besides, 13 students underwent practical training in agriculture.

In the Agricultural Research Station, Anakapalli, there were 31 boys on the roll of the juvenile labourers school. Of these, 24 appeared for the examination and 23 passed.

One Koya boy and eight students received training in practical agriculture.

3. *Season and its effects on crops.*—In North Vizagapatam division, the average rainfall received during the period was 31.61 inches, about 9 inches below the average. The South-West monsoon was weak and erratic, consequently the yield of both ragi and paddy crops was below the normal. The North-East monsoon was a failure and it affected the yield of paddy and jonna crops.

In South Vizagapatam division, the average rainfall received during the period under review was 32.08 inches, about 8 inches below the average. The South-West monsoon was weak to start with and consequently the rainfed crops received a set back and paddy crop had to be planted late. The North-East monsoon was satisfactory. The dry spell that lasted from December 1944 to end of April 1945, had an adverse effect on sugarcane crop.

In East Godavari district, the rainfall received during the fasli was 46.81 inches, about six inches above the average. The South-West monsoon was slightly late and it affected the paddy nurseries in the upland taluks.

Paddy, gingelly and fodder crops in lankas of lower zone were submerged and failed. Chillies and tobacco nurseries in lankas of higher zone were submerged and failed. There was a dearth of tobacco seedlings and they were purchased from Guntur district.

In the Bhadrachalam Agency, paddy crop was submerged, with the result very poor yield was obtained.

A part of Gannavaram aqueduct was washed away. The area under second crop paddy in the Nagaram island, commanded by the canal passing over the aqueduct, was reduced considerably, owing to dearth of water supply.

North-East monsoon was rather heavy in October 1945, and it interfered with the harvest and threshing operations of paddy crop. Owing to uncertainty of water supply, only 65 per cent of the normal area was raised with second crop paddy.

In West Godavari district, the rainfall received during the period was 43.53 inches. The South-West monsoon was late and

erratic. The dry land crops were affected and gingelly crop fared worst. The North-East monsoon was rather heavy in October 1945. More harm than good was done. Tobacco nurseries were badly affected and seedlings had to be got from Guntur district. There was dearth of paddy seed for second crop—M.T.U. 9 and 15—as the crop raised in first crop season was damaged by heavy rainfall.

I. CROPS.

4. *District Work*—(a) *Paddy*.—Food crops in general and paddy crop in particular received much attention during the fasli under review. Intensive propaganda was done towards increasing the area under the crop as well as the yield. The response was good. Under Takkavi (free of interest) loan systems, large quantities of seeds of Departmental strains and manures were distributed. A rapid and remarkable progress was achieved under this method.

The main items of improvements advocated along with approximate area brought under them are furnished below:—

	Fasli. 1943-44.	Fasli. 1944-45.
	ACS.	A. S.
Sheep penning in nursery	10,709	21,408
Thin sowing in nursery	64,910	112,168
Economic planting of main field by two or three seedlings instead of in bunches.	567,711	701,811
Application of green leaf as manure	188,551	213,220
Application of oil cakes as manure	86,646	186,563
Application of chemical fertilizers	3,241	21,131
Area under departmental strains	955,108	1,139,981
Departmental strains—Quantity of seed distributed.	4,535,493 lb.	5,086,895 lb.

(b) *Millet*s.—Millets did not receive much attention due to concentration of work on paddy crop.

In the fasli under report, 13,279 lb. of ragi seed against 16,259 lb. of last fasli, 15,713 lb. of sajja seed against 15,189 lb. of last fasli and 13,486 lb. of cholam seed against 1,875 lb. of last fasli was distributed.

In North Vizagapatam, Chodi strain No. 525 was found to fare better than local both under irrigated and rainfed conditions.

(c) *Oil seeds*.—Seeds of departmental strains—A.H. 25 (spreading type) and A.H. 45 (erect type)—continued to be distributed. The quantity of seed distributed was 11,443 lb. against 7,605 lb. of last fasli.

In the next season (i. e., 1946)—A.H. 698 (spreading type)—a new strain that had given higher yield, as well as higher shelling percentage than A.H. 25 in southern districts, will be tried.

(d) *Sugarcane*.—Over 98 per cent of the area under sugarcane in all the districts of this circle was under Coimbatore varieties,

particularly C.O. 419. Other varieties that were found to be having a natural spread were C.O. 421, 449 and 527. They mature earlier than the popular variety—C.O. 419. Due to high price prevailing in the market, area under sugarcane increased appreciably.

The main lines of improvement advocated consisted of wider planting (2½ feet apart), construction of improved type of jaggery furnace and demonstration of good quality jaggery making. During the period under review, wider planting was demonstrated on 63,594 acres against 41,010 acres of last fasli. The construction of 634 furnaces was improved against 125 of last fasli. Over 3,383 demonstrations of good quality jaggery making were done against 2,565 of last fasli.

Sugar factories at Sitanagaram, Bobbili, Tumpala, Etikoppaka, Kirlampudi and Samalkot were functioning very satisfactorily. For each factory, zones of villages were demarcated for supply of raw material and in such villages ryots were prohibited from manufacturing jaggery.

(e) *Fodder—Crops and grasses*.—The main items of work consisted of introduction of fodder crops, e.g., pillipesara and fodder jonna and fodder grasses, e.g., Guinea and Napier grasses. Over 17,51,602 lb. of fodder crop seed was distributed against 7,592 lb. of last fasli. Over 1,000 Guinea grass slips were sold.

(f) *Fruits*.—Mango and citrus grafts totalling 23,182 were distributed. Demonstrations were conducted on methods of pruning dead twigs and “Die-back” affected parts, ring method of irrigation and spraying against plant lice.

(g) *Fibre crops*.—During the period under review, no cotton seed was distributed.

Cultivation of Tellapatti (otherwise known as Buradapatti or Chinnapatti) was prohibited in Visakhapatnam district, with effect from June 1944. This variety was cultivated as a mixture in dry land along with redgram or Arika and in wet land along with Gingelly after harvest of paddy. The seed rate used was about 3 to 5 lb. per acre and being a very small quantity the ryots have not increased the seed rate of the other crop that formed the mixture.

By eliminating it from the mixture, the yield of other crop also was reported to have not increased because the yield of the mixed crop entirely depends on the receipt of timely and adequate rainfall.

(h) *Tobacco*.—Seed of Harrison Special No. 9 (185 lb.) was distributed in the East and West Godavari districts. There was a heavy downpour of rain in October 1944 and it considerably damaged the nurseries. The ryots were therefore forced to obtain seedlings from Guntur district.

(i) *Chillies*.—Seed of Guntur farm strain (No. 398)—143 lb. was distributed.

(j) *Wheat*.—In East Godavari district, 3,308 lb. of wheat seed was sold and it was sown in October/November 1944 over 132 acres. The season being adverse, the crop failed.

(k) *Potato*.—Potato seed—Great Scot variety—6,000 lb. was distributed in West Godavari district and the crop was cultivated in October/November season in Eluru and Chintalapudi taluks. The tubers harvested were of fairly big size with attractive colour.

One ryot of Dharmajigudem, who cultivated over one acre, was reported to have sold the produce for Rs. 900.

(l) *Vegetables*.—Much attention was paid to increase the area under vegetables. About 32,940 packets of seeds of all kinds were sold. The additional area brought under cultivation was 479 acres.

II. SOIL EROSION.

Intensive propaganda was done regarding steps to be taken to prevent soil erosion. An area of 300 acres were bunded.

III. IMPLEMENTS.

The number of demonstrations conducted with iron ploughs was 3,965 against 2,480 of last fasli. A sum of Rs. 2,410 was issued to ryots for purchase of implements.

IV. MANURES AND GREEN-MANURE SEEDS.

Under Trading scheme, the following quantities of manures were stocked and sold :—

	LB.	TONS.
Oil-cake	38,358,027	over 16,231
Ammonium sulphate.	3,994,306	,, 1,738
Other chemical manures	1,726,172	,, 770

Green-manure seeds.—1,717,793 lb. (over 563 tons) were sold against 700,644 lb. (over 312 tons) of last fasli.

The ryots adopted the following improved methods in the preservation of cattle manure :—

Manure preservation in pits and heaps ..	48,751
Dry earth sheds and litter byres ..	36,333
Compost	11,370

V. LOANS.

A sum of Rs. 2,410 was issued for purchase of implements.

Takkavi loan, free of interest, was issued on personal security up to a limit of Rs. 75 per individual till April 1945 and Rs. 80 later on. The loan was disbursed both in kind (seed and manure)

and in cash. The demand was very keen. During the period under review, a sum of Rs. 27,00,911 was disbursed to 26,720 loanees against Rs. 7,44,134 disbursed to 12,871 loanees of last fasli.

A Gazetted Assistant was specially appointed with effect from August 1944 to be in charge of loan disbursement in East Godavari district.

VI. PESTS AND DISEASES (LEGISLATION).

The provisions of the Madras Agricultural Pests and Diseases Act were enforced in the following cases :—

(a) *Palmyra Bud-rot disease* in East and West Godavari districts. A special Revenue Departmental staff was in charge of the scheme. Palmyra trees numbering 26,917 were treated.

(b) *Red-hairy caterpillar pest* damaging rainfed crops particularly groundnut in Chicacole, Palakonda, Parvatipur, Bobbili, Cheepurupalli, Tekkali and Narasannapeta taluks of North Vizagapatam.

A special staff of maistries was employed for a period of four months, to educate ryots about the life-history of the pest and the remedial measures to be adopted.

(c) *Broom-rape affecting tobacco*.—A special staff of maistries was employed to advocate ryots to pull out the parasite and bury it deep. The scheme was under the direct control of the Special District Agricultural Officer, who had his headquarters at Guntur. The parasite was removed over 3,978 acres.

(d) *Water-hyacinth* in the East Godavari district.

VII. DEMONSTRATION AND TRIAL PLOTS.

Various improvements advocated by the department were brought home to the cultivators by conducting practical demonstrations in their own lands. These demonstrations consisted of varietal, cultural, manurial and remedial measures against insect pests and fungus diseases. There were 1,308 demonstration plots during the period under review.

Citrus trees numbering 2,246 trees were treated for damage done by bark-eating caterpillar and 890 trees were treated for gummosis and die-back.

Spraying of calcium arsenate was done over 50 acres of epilachna infested brinjal crop and 10 acres of tobacco infested with plant lice.

Citrus trees numbering 52,040 were pruned.

In North Vizagapatam division, Samalkot farm strains 17 and 18 were found to fare better than Anakapalle farm strains, viz., Sunkisannam 5 B.G. 1, Mypali 7, G.S. 47, B.H. 1, and M.P. 30.

In South Vizagapatam division, S.L.O. 18 was tried against Kitchilisamba with success.

VIII. AGRICULTURAL ASSOCIATIONS.

There were 385 "Grama Sanghams" working against 220 of last fasli. The number of meetings held were 2,489 against 1,304 of last fasli. In the meetings, the members were advised to adopt improvements advocated by the department and increase area under food crops.

IX. EXHIBITIONS.

A regional fruit and vegetable show was held at Vizagapatam in October 1944. It was a great success and gave an impetus to increase area under fruit and vegetables.

Small exhibitions, numbering 68, were held in connexion with local fairs festivals. The public took keen interest in the exhibits displayed and subsequently there were many enquiries.

X. PUBLICATIONS.

In the exhibitions and in the depots, leaflets were distributed free. Over 2,584 copies of villagers' calendars were sold.

The departmental journal "Padi Pantalu" was well received by the ryots. The articles were eagerly read and consequently there were many enquiries regarding Departmental activities.

XI. FREE ISSUE OF CROP AND GREEN MANURE SEEDS AND ALSO MANURES.

Poor and deserving ryots were given seeds—free up to the limit fixed Rs. 100 for each district.

Besides, in each district, Rs. 2,000 worth of green manure seeds and manures were distributed free to poor and deserving ryots.

XII. FREE ISSUE OF PULSES SEED.

Redgram seeds 95,000 lb. were distributed free, for growing along with groundnut as a mixture. The main distribution will start only in July 1945 and as such full details will be given in the next report.

XIII. CROP CUTTING EXPERIMENTS.

In all the districts the Agricultural Demonstrators in addition to their regular duties, carried out crop cutting experiments, as desired by the Board of Revenue, on irrigated paddy, ragi, jonna and sajja and also on rainfed paddy, ragi, jonna and sajja. Over 333 experiments were conducted.

XIV. APIARY.

In all the districts, bee-keeping scheme was in progress and worked satisfactorily. About 2,800 bee-colonies were working satisfactorily and 9,534 lb. of honey was collected and sold.

XV. NEW WELLS DUG.

In the fasli under report, 1,119 wells were dug and about 5,000 acres of dry land were converted to garden land.

XVI. NEW LAND BROUGHT UNDER CULTIVATION.

As a result of grow more food campaign 2,487 acres were assigned and 23,755 acres of cultivable fallow were brought under plough.

XVII. NEW SCHEMES.

(a) *Paddy seed multiplication scheme*.—In all the districts, the paddy seed multiplication scheme was in force. Seed farms of departmental strains that have been found by trial and demonstration suitable to the tract were organized. Seeds were purchased, stocked and sold. The area under seed farm was 6,172 acres.

(b) *New Irrigation Schemes*.—In West Godavari district, 11 new irrigation schemes were sanctioned by Government at an estimated cost of Rs. 10,47,742. They were expected to bring an additional area of 13,620 acres. Of these six schemes covering an area of 5,780 acres have already been completed.

(c) *Sugar ancillary scheme*.—In Palakonda taluk, North Vizagapatam division, the scheme was tried in four villages. In each village 30 demonstration plots were laid out. A special staff consisting of one fieldman and three maistries was employed. In the varietal plots C.O. 527 an early maturing variety was compared with C.O. 419. In the cultural plots, the ratooning capacity of these two varieties was under observation. In the manurial plots, the local practice of applying 5 tons of cattle manure along with sheep penning (about 1,000) was compared with application of 100 lb. Nitrogen ($1/3$ in the form of sulphate of ammonia and $2/3$ in the form of groundnut cake).

In Ramachandrapur taluk, East Godavari district, both manurial and varietal demonstration plots were laid out. In varietal plots C.O. 527 was compared with C.O. 419 and Purple Mauritius. In the manurial plots 100 lb. Nitrogen ($2/3$ as castor cake and $1/3$ as sulphate of ammonia) was compared with local practice of sheep and cattle penning along with 5 tons or 10 cart-loads of cattle manures. A special staff of one fieldman and three maistries was in charge of the scheme.

(d) *Sugar excise fund scheme*.—A special staff consisting of two maistries was employed to spread the improvements advocated by the department in nine villages served by the Sugarcane growers' Co-operative Society, Kirlampudi.

(e) *Rubber vine scheme*.—A special maistry was employed from September 1944 to March 1945, to demonstrate collection of rubber from rubber vine—*Cryptostegia grandiflora*. He toured both in East and West Godavari districts and collected only 6 lb. of rubber.

(f) *Koya uplift scheme*.—Three villages were selected in Bhadrachalam Agency taluk and work was concentrated. A sum of Rs. 496 was granted as loan, free of interest, to Koyas both in kind and in cash. The Koyas evinced keen interest and took to improvements advocated by the department.

During the fasli under review, a fresh set of three villages were taken.

(g) *Flood relief scheme*.—In August 1944 there was a very heavy flood in the Godavari and this caused considerable damage to the standing crop of paddy. A portion of the Gannavaram aqueduct was washed away.

A special staff consisting of one Agricultural Demonstrator, one clerk and six maistries was employed for a period of three months.

Sunhemp seeds to the extent of 1,182 bags were distributed and the seed produced was purchased for Rs. 2,000 from growers for distribution. A sum of Rs. 175 was spent towards free distribution of seeds and a further sum of Rs. 998 was spent on free distribution of fodder to poor ryots.

(h) *Jonna smut control scheme*.—A scheme was sanctioned for the demonstration of treating Jonna seed with sulphur dust. In that connexion two tons of sulphur dust was supplied. The scheme will come into force from 1st July 1945. It will be dealt with in the next report.

(i) *Chilli thrips control scheme*.—For a period of six months, a special maistry was sanctioned for conducting demonstrations of control measures against thrips affecting chilli crop. The work was concentrated in three centres of Pitapur taluk, East Godavari district, over 50 acres. Due to prohibitive cost of insecticide, the spraying was not economical.

(j) *Civil vegetable supply scheme*.—Government sanctioned a scheme for encouraging vegetable cultivation for civil consumption in areas where military was stationed.

One fieldman and one messenger was appointed in Bobbili taluk, North Vizagapatam division for carrying on intensive propaganda regarding increasing area under vegetable cultivation. The work was concentrated in nine villages. The ryots were given seeds and manures worth Rs. 250.

In the South Vizagapatam division five fieldmen and five messengers were employed to carry on intensive propaganda in five taluks to increase area under vegetables. The number of ryots tackled was 115 and they were given a subsidy of Rs. 2,842.

The total quantity of vegetables produced in the scheme was 40,000 lb. and 100 lb. of seed.

(k) *Military vegetable supply scheme*.—The posts of Special District Agricultural Officer in charge of vegetable supply and the Assistant Special Officer in charge of fruits and onion supply were abolished with effect from 1st December 1944. The District Agricultural Officer, Anakapalle, was placed in charge of the scheme, in addition to his own duties.

Real cultivators were organized to grow and supply the requirements of the military authorities. The total quantity supplied during the period under review was as shown below:—

		LB.	TONS.
(i) Vegetables—			
Indian types	.. ..	1,216,496	over 543
English types	.. ..	53,971	„ 24
(ii) Fruits—			
Plantains	.. ..	512,954	„ 229
Mangoes	.. ..	35,630	„ 16
Oranges	.. ..	125,199	„ 58
Pineapples	.. ..	24,667	„ 11
(iii) Onions	.. ..	495,081	„ 220

(l) *Eri culture*.—Eri silk worm rearing was tried at Samalkot Farm. Three broods were successfully reared, yielding about 5 lb. of pierced cocoons. The fourth brood was affected by severe summer and moths did not emerge.

(m) *Intensive propaganda scheme*.—The scheme which was working in three taluks of North Vizagapatam division, was merged in the new scheme of additional maistries that were sanctioned.

The scheme which was working in South Vizagapatam division in six taluks was merged in the new scheme of additional maistries that were sanctioned.

The work done by these special maistries—four for each taluk—is included in the figures furnished in this report.

XVIII. JOINT WORK WITH OTHER DEPARTMENTS.

The departmental officials were also in touch with the officials of other Development Departments such as Revenue, Irrigation, Co-operative, Industries, Veterinary, Education and Forest and non-official public bodies such as Sugarcane Growers' Co-operative Society, Vegetable Growers' Co-operative Society, Fruit Growers' Co-operative Society, etc.

XIX. SALE OF IRON MATERIAL.

The following sales were effected :—

			TONS.	LB.	NUMBER OF PAIRS
Cart tyres	..	..	139	1,286	2,483
Axles	..	..	33	2,073	888
Standard steel	..	..	79	641	—
Defectives	..	..	450	251	..

5. *Agricultural Research Station, Samalkot.*—The average yield of paddy obtained from bulk plots was 2,860 lb. of grain per acre. Eighteen farm strains were multiplied for seed distribution. Six doses of "N" in the form of groundnut cake from 0 to 80 lb. per acre was tried on paddy crop. There was no differential response in yield to increased doses of "N". In the inter-seasonal trial, results indicate that S.L.O. 16 paddy strain is the only variety which will come to harvest early enough to admit raising of an intermediate crop of G.E.B. 24 before the regular second crop commences.

Seven varieties of sugarcane were compared with C.O. 421 as the standard. C.O. 542 variety gave the highest yield 50.58 tons of cane per acre but the statistical difference was not significant.

Five varieties of sugarcane were compared with C.O. 419 as the standard. The yield of C.O. 545 (47.88 tons of cane per acre) was not statistically different from the control.

6. *Araku valley development scheme.*—The main and immediate object of the scheme was to cultivate 1,250 acres under potato and English types of vegetables and supply to the military at Vizagapatam. In February 1945 about 20 acres were planted with potato (Great Scot variety) but due to long spell of drought and failure of water-supply in irrigation sources, the crop suffered and the yield was consequently very poor about 600 lb. per acre. Cabbage was planted over 3 acres from January 1945 to March 1945. Only January planted crop formed heads, while February and March planted crop completely failed. A quantity of 1,727 lb. obtained from January 1945 planting was supplied to the military.

The Special Assistant Agent and the Forest Officer of the Jeypore Estate rendered all possible help to supply adequate labour.

In 1945, for summer cropping only 300 acres out of the target figure 1,250 acres have been proposed to be taken up, since it will not be possible to manage more, this year. Out of that, 200 acres will be raised with potato and 100 acres with English types of vegetables.

The six trial borings conducted by the Industries Department failed to tap the under-ground water successfully even though they went over 80 feet below ground level. Government have ordered that further trials should be conducted. The pond at Padmapuram village and another one at Kothavalasa village were deepened. It will be possible to raise about 20 to 25 acres of potato and vegetables under these two ponds between October 1945 and February 1946. Apart from these two ponds there are no other sources of irrigation. Proposals sent regarding bunding of hill stream at Jilda and bringing it at a cost of Rs. 16,000 were still pending with Government.

Six pairs of cattle were purchased. Besides, there were two tractors. With the aid of these two, over 300 acres were ploughed, harrowed and kept ready for planting potato crop in August-September 1945.

Since April 1945, vegetables were supplied daily to the staff from the kitchen garden that was specially raised. The proposal to start a dairy concern was still pending with Government. Trials were in progress about cultivation of pyrethrum and cinchona. Attempts were made to raise seedlings.

A Special Agricultural Demonstrator, was appointed to be in charge of distribution of seeds and manure free to Hillmen. Over 800 lb. of ragi seed, 4,000 lb. of paddy seed, 500 bags of groundnut cake and 250 maunds of ammonium sulphate will be distributed in July-August 1945.

7. *Agricultural Research Station, Anakapalli.*—The average yield of paddy crop from bulk plots was 2,580 lb. per acre. Seventeen varieties of paddy were grown on a bulk scale for seed multiplication. Single plant selection work was in progress in paddy and chodi crops. Increased yields were recorded in paddy crop with the increase in "N" dose, applied up to 60 lb. per acre, in the form of oil cake irrespective of variety tried or the form of manure applied.

In chodi, strain A.R. 310, recorded the maximum yield of 2,840 lb. of grain per acre against 2,526 lb. yielded by strain 525 the control.

In ganti, of the six varieties included in a trial, A.G. 6 recorded the maximum yield of 1,054 lb. grain per acre.

In the trials conducted in the district A.R. 125 chodi strain for irrigated crop and A.R. 38 for rain-fed crop fared best. Ganti strain A.G. 4 and Jonna strain A.J. 3 were found to yield better than local.

In the sugarcane yield trial (Mid-season). C.O. 449 gave the maximum yield of 42.46 tons of cane per acre against 40.37 tons given by C.O. 421 the control.

In the late season yield trials, CO. 444 gave the maximum yield of 45.77 tons of cane, against 43.22 tons given by CO. 419 the control. In the ratoon experiment CO. 419 fared best as plant crop as well as first and second ratoon crop. The cost of production worked out to Rs. 9 per ton as plant crop, Rs. 7 per ton as first ratoon and Rs. 8-8-0 per ton as second ratoon crop. In the manurial experiment laid out, application of 150 lb. of "N" per acre was found to be the optimum and profitable dose for CO. 419 variety.

8. *Agricultural Research Station, Gudiyatham.*—In the yield trial for early varieties CO. 545 gave 33 tons of cane per acre and CO. 444 gave 31 tons, while the control CO. 421 gave only 26 tons.

In the yield trial for late varieties CO. 449 gave 31 tons of cane per acre while CO. 419 the control gave 28 tons.

9. *Land Colonization schemes.*—Four Co-operative Land Colonization Societies were functioning in West Godavari district. The Department lent the services of two Agricultural Demonstrators who were running the scheme.

VIZAGAPATAM,
27th August 1945.

M. KANTIRAJ,
Deputy Director of Agriculture.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, GUNTUR, FOR FASLI YEAR 1354 (1944-45).

Charge and staff.—The Northern Division with headquarters at Guntur comprising of North Visakhapatnam, South Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Nellore, Kurnool and Bellary districts, was bifurcated into two units in the month of January 1945. A separate Deputy Director of Agriculture with headquarters at Visakhapatnam was posted for North Visakhapatnam, South Visakhapatnam, East and West Godavari districts and the office commenced to function from 29th January 1945. Sri Y. G. Krishna Rao Naidu was in charge of the division up to 4th July 1944 and went on leave for two months after handing over charge to Sri S. Sitaram Patrudu, on 5th July 1944 forenoon. In March 1945 Sri S. Sitaram Patrudu, went on leave for 15 days from 4th March 1945 afternoon, and Sri S. Venkatraman, District Agricultural Officer, Guntur, was in additional charge of the division (current duties).

The following were in charge of the administrative units noted below :—

- (1) Guntur—
 - (1) Sri S. Venkatraman.
 - (2) Sri K. Venkatraman (one month and ten days).
 - (3) Sri G. Seetarama Sastry (20 days).
- (2) Krishna—
 - (1) Sri L. Narasimhachari.
 - (2) Sri A. Gopalakrishnayya Naidu (one month).
 - (3) Sri M. Narasimham as Gazetted Assistant for loans (from 1st July to 30th September 1945).
 - (4) Janab Mirza Ansari Baig, Probationary District Agricultural Officer for training.
- (3) Nellore—
 - (1) Sri M. V. Raghavarao Naidu.
 - (2) Sri A. Gopalakrishnayya Naidu.
- (4) Kurnool—
 - (1) Sri V. K. Subramanya Mudaliar.
 - (2) Sri T. Krishna Reddy (Personal Assistant Demonstrator-in-charge).
- (5) Bellary—
 - (1) Sri R. N. K. Sundaram.
 - (2) Sri M. Narasimham.
 - (3) Sri G. Sakharama Rao.

- (6) Special District Agricultural Officer, Tokra, Guntur—
 Sri R. Swami Rao.
 Sri M. Narasimham.
 Janab Muhammad Ali Saheb Bahadur.

Personal Assistant Demonstrators and Accountants for the trading schemes, were posted to the District Agricultural Officers' offices to help them in getting through the heavy work.

2. *War Efforts and Increased Production of Food-crops and Vegetables.*—The departmental staff spared no pains in presenting a correct view of the present war situation to the ryot population while on tour. The cultivators were requested to contribute liberally for the successful prosecution of war. As a result of this generous co-operation German Army collapsed on 7th May 1945 and Victory Day was celebrated throughout the division. The need to continue the active co-operation till the final victory was achieved over the Japanese as well was stressed in all the subordinates' tours. On 15th August 1945 at the time of writing this report, the Japanese surrendered and accepted the unconditional terms of the allies. The co-operation of the National War Front was sought for to increase crop production in connexion with "Grow More Food Campaign."

Sites intended for land colonization schemes for demobilized soldiers were inspected and reports sent by the departmental staff to concerned officers.

3. *Grow More Food Campaign.*—In the Bellary district the area under Mungari cotton was reduced by 86, 131 acres and an area of 16,610 was grown with food crops. Nearly 20 per cent over the normal area of Korra was sown. Legislation was enacted prohibiting the cultivation of pure crop of cotton. The concessions granted by the Government for growing food crops were explained to the ryots. All useful waste lands, porambokes, land along the railway lines were brought under cultivation.

A. Seeds and manures up to Rs. 2,000 in a district were freely distributed to deserving poor ryots. Prizes were awarded to enthusiastic ryots from the Collector's discretionary grants to serve as an incentive to the neighbouring cultivators. 'Grow More Food' Weeks were celebrated with the co-operation of Revenue and other departments and lectures delivered by the departmental subordinates.

Interest-free loans for the purchase of implements up to Rupees 15,138 and for the purchase of seeds and manures up to Rs. 9,38,976 were granted in the year under report.

The department virtually took up the control of procurement and distribution of all kinds of manures in the division oil cakes and chemical fertilizers. The ryots were able to procure their requirements at controlled rates both from the several agricultural depots and sub-depots opened for the purpose and from the several licensed dealers. Movement and stocking of cakes was arranged for December demands from the producing centres to consuming tracts, to

meet the expected demands of the coming season. Sufficient quantities of manures have been stored and it has reached a level of self-sufficiency. The sale of the manures in the division amounted to about 18 lakhs of rupees.

Seed multiplication plots were arranged in deltaic taluks of the division for paddy and in dry taluks for cholam, etc. Sufficient high yielding departmental strains were made available to ryots from the Agricultural depots opened for the purpose in various parts of each taluk.

Special schemes in connexion with growing more vegetables of potatoes and onions to meet the demand of the Military and Civil population were also undertaken and run. Indigenous and exotic vegetables were supplied in small packets to the public to increase the vegetable production.

Two thousand tons of iron materials were handled by the department in the year under report. Barn materials, cart tyres, axles and other agricultural tools and implements were obtained and sold to ryots. In addition, materials useful for manufacturing spades, guntaka blades, plough shares, gorru tyres, cart tyres, etc., were also distributed to the cultivators to enable them to fabricate the materials supplied with the help of village artisans. Fabricators were also appointed in the districts to manufacture tools and implements for sale at rates fixed by the department.

It may be concluded that due to the sustained efforts of the department in all directions, coupled with the introduction of rationing, there was practically no dearth of food stuffs in any place in this division, in spite of lack of imports of Burma rice. This alone is enough to speak of the successful activities of the department in connexion with 'Grow More Food Campaign' inaugurated by the Government.

4. *Agricultural education.*—As usual practical training in agriculture was given to sons of agriculturists in the various Agricultural Research Stations. To cope up with the increased demand for trained subordinate staff, a start was made to give training for selected literate candidates both for fieldmen and maistris posts in the various Agricultural Research Stations of the division. An impetus to this was given by the grant of stipends and travelling allowance to selected candidates.

A Second Agricultural College at Bapatla was inaugurated to admit 96 students. The college was opened by Sir S. V. Ramamurthy, K.C.I.E., I.C.S., Adviser to His Excellency the Governor of Madras. With the opening of this college enough agricultural graduates will be in the field in the course of a few years to solve the dearth of technically qualified men.

Agriculture as optionals for the Intermediate Arts Course in the Hindu College at Guntur and in the High Schools at Duggirala and Buchireddipalem was continued.

5. *Season and its influence on cropping.*—Rainfall in fasli 1354—

District.				Average fall in inches for the 51 years ending 1920.	Rainfall during 1944-45.
Guntur	..	..	..	31.8	38.22
Krishna	..	..	..	37.0	38.17
Nellore	..	..	..	35.0	44.74
Kurnool	..	..	..	25.7	25.66
Bellary	..	..	..	23.2	25.02

South-west monsoon.—The season though late by a fortnight, had the rains evenly distributed. Paddy nurseries were sown late due to non-receipt of water in the canals. The dry crops like groundnut, jonna, korra, cumbu were sown in July and had no benefit of showers till September. Their growth was poor. At the time of grain setting they were caught by heavy rains.

North-east monsoon.—This also was late and very heavy throughout the five districts. The sowings of the pyru crops had to be delayed by a month till the land got too condition. The harvest of groundnut was caught in the heavy rains. After sowings of pyru crops and transplantation of chillies and tobacco there were practically no rains. The paddy crop in the deltas did not suffer much. In Bellary and Kurnool districts the heavy rains of October had a depressing result on the yields of korra and jonna crops. The price of tobacco seedlings went up to Rs. 40 to plant an acre.

The season in short was fair for the early-sown crops and unfavourable for the pyru crops.

6. *Demonstration and propaganda.*—The department in addition to being a mere propaganda and advisory body took up an active part in procuring the necessary agricultural needs of the ryot population. The stocking and distribution of large quantities of seeds, manures, iron and steel at the ryots doors was taken up in the year. A Special Officer for sanctioning loans was posted to Krishna district. More and more agricultural depots in all central places of each taluk were opened. The subordinate staff was suitably increased to cope up with the increased activities of the department. Each Revenue firka had a maistri. Two Marketing Assistants at Guntur were posted. One was put in special charge to meet the necessary demands of cultivators in the villages bordering the Buckingham Canal. In the year under report 1,484 demonstration plots, 425 observation plots and 41 trial plots were laid.

7. *Crops*—(i) *Paddy.*—This is the premier food crop of the division. Main items of improvements carried out on this were varietal, cultural and manurial.

(a) *Varietal.*—In the delta MTU. 7 akin to local Kusuma occupied a major area. MTU. 12 Stragada, MTU. 19 Sanna

Kusumma (Konamani) were the next two important strains in Guntur and Krishna districts. S.R. 26-B for saline soils and GEB. 24 for tank-fed areas were popular. For Nellore conditions strain Nos. 2552 and 2555 (selections of Molakolukulu) were found suitable for the main season.

An area of 4,250 acres was under seed farm and 32,489 bags of seed farm produce were purchased for distribution. The area expected to cover from this seed for next season is about 340,500 acres. The total area under all the improved strains of paddy was 832,868 acres.

(b) *Cultural.*—Thin sowing of seed beds and economic planting were in vogue in the delta and the propaganda was found necessary only under tank-fed areas. Eighty-three thousand five hundred and sixteen acres were under this improvement.

(c) *Manurial.*—Green manuring and green leaf manuring was done in a total area of 212,215 acres in the division. The application of groundnut cake, castor cake and chemical fertilizers was done in an area of 300,960 acres. For the 1945-46 season enough supplies of ammonium sulphate and ammonium phosphate (3,500 tons) have been received. It is estimated that 20,000 tons of cake in Guntur district and 25,000 tons in Krishna district would be made available for the 1945-46 season. This quantity is being stocked in sub-depots opened for the purpose.

(ii) *Cotton*—H. 1. *Cotton.*—This occupied an area of 5,050 acres in the Pattikonda taluk of Kurnool district and a scheme for seed multiplication was undertaken there. In the Bellary district the area under H. 1. was 120,000 acres. The H. 1. scheme was run with the joint efforts of the agricultural and Co-operative departments and financed by the Indian Central Cotton Committee.

There was an area of 3,000 acres of H.1. seed farm. Six lakhs thirty-two thousands nine hundred and sixty-seven pound of seeds were obtained and transferred to the several depots in consuming centres. The normal area under cotton in the Bellary district is $5\frac{1}{2}$ lakhs of acres, but in the year under report the area was only $3\frac{1}{2}$ lakhs of acres mostly due to unfavourable seasonal conditions, low market rates, and the stimulus given by the Government for increased food production.

Northerns.—N. 14 occupied an area of 20,200 acres as against 25,000 acres of previous year and 37,000 of 1942-43. The normal thus is 177,000 acres.

X. 20 *Cotton.* (G. 1).—This strain occupied an area of 309 acres in the division. It was found suitable for the upland taluks of Guntur and Krishna districts. It is not only high yielding with better quality lint, but has great dye absorbing capacity. Thirty acres were arranged under seed farm conditions.

Mungari cotton.—No departmental strains are yet available for distribution to replace the locals.

(iii) *Millets—Jonna*.—This is the next important food crop of the division. In the Guntur district G.J. 869 yellow and G.J. 916 red for the Punasa season and G.J. 103 and G.J. 75 for pyru were advocated. G.J. 75 as a fodder crop was more in demand. Strains N 29/68, 28/3 and T.6 of Nandyal were popular in the Kurnool district. Strain T. 1 and M. 47-3 are gaining popularity in Bellary district.

The area under improved strains in the division are—

	ACS.
Guntur	78,819
Krishna	1,075
Nellore	500
Kurnool	68,460
Bellary	154,000
	302,854

Cholam smut was controlled to a great extent by treatment with sulphur dust. Sixteen thousand and five hundred pounds of sulphur were sold in the division enough to cover an area of 304,000 acres.

Ragi.—R. 42 in Guntur district, AKP. 525, EC. 593 and FR. 42 in Nellore were grown in small areas. In the Kurnool district R. 42 and EC. 593 occupied an area of 2,100 acres. R. 42 was also popular in the Bellary district and occupied 3,000 acres. There is a good scope for the spread of R. 42 Ragi.

The total area under improved strains was—

	ACS.
Guntur	600
Nellore	310
Kurnool	2,100
Bellary	3,000
	6,010

Korra.—G.K. 6 in Guntur was the popular strain for lighter soils. NK. 132, 140, GK. 6 and K. 68 were grown in Kurnool. The area under this in 1944-45 has nearly doubled. K. 68 for black soils and K. 23 for red soils of Bellary district were found suitable, the strains having covered double the area of last year. Arrangements are being made for the seed multiplication of the above strains in all the districts. Areas under the improved strains in the division are—

	ACS.
Guntur	840
Nellore	161
Kurnool	33,330
Bellary	25,000
	59,331

Sajja.—There is no suitable strain in this crop except P.T. 700 which occupied 1,716 acres in Guntur district. It is not found suitable in other places and there is no scope for its spread.

(iv) *Sugarcane*.—In the Krishna district the crop is confined to a few villages round the Vuyyur factory. Co. 419, 421, 349 and 527 were the popular varieties. Co. 419 occupied 80 per cent of the area. Two thousand two hundred and nine acres of fresh crop was planted in the year and about 1,600 acres of the previous year's crop was allowed to ratoon. About 3,809 acres are now standing for 1945-46 season. In the season (9th January to 13th April 1945), 67,470 tons, the produce of 3,015 acres of crop planted in the previous year were crushed. The period of crushing lasted to 76 days. The recovery was 9.2 per cent as against 9.4 of last year. Co. 527 and 349 were found to be suitable for early and midseason. The K.C.P., Ltd., distributed 9,220 bags of black castor cake and 21,202 bags of groundnut cake for the cane growers under loans. The department with the help of special staff co-operated with the factory; a report of the work done in this division is appended.

In the Bellary district the crop occupied 9,000 acres. Co. 419 and Co. 290 have practically replaced the local canes. Line planting, wide spacing, judicious manuring and intercultivation with improved implements and proper methods of jaggery preparation were demonstrated. The sugar factory at Hospet started work on 16th November 1945 and closed down on 10th April 1945. Sixty-three thousands tons of canes were crushed and 17 villages were under the sugarcane commandeering scheme.

(v) *Groundnuts*.—The normal area under this important crop in the five districts is 1,160,000 acres. AH.32 and AH.25 were the strains which the department has been distributing for a long time. For sandy soils AH. 25 was found more suitable. There is yet no suitable strain to replace the local bunch short duration variety. The total area under the improved strains is only 9,993 acres spread as under :—

Guntur	6,070
Krishna	607
Nellore	16
Kurnool	840
Bellary	2,460
	9,993

(vi) *Tobacco*.—There was a great demand for the departmental Virginia tobacco seed H.S. 9. Special seed multiplication schemes for seed supply both for Madras Province and outside, financed by the Imperial Council of Agricultural Research were under the Special District Agricultural Officer for Tokra, Guntur. A total quantity of 6,886 lb. of H.S. 9 was distributed in the division. Fifty-nine thousand acres were estimated to be the area under this strain in the Guntur and Krishna district. Tokra was

prevalent to a less serious degree than in the previous year. Pest Act operations were enforced by the staff of the Special District Agricultural Officer, Guntur. A new type 'Amerello 5' is being released by the Imperial Tobacco Research Station. This has an advantage. The time taken in curing is less and more quantities could be cured in a given time as compared to others. The cultivation of other types like White barely for wrappers, Turkey for blending was carried on in small areas. Messrs. The Indian Leaf Tobacco Development Co., Ltd., imported new type 'Dombarra' from Ceylon and it seems to suit the tract as a heavy yielder. In the year the area under Virginia in the two districts (Guntur and Krishna) was about 75,000 acres. Tobacco still remained as the cash crop of the dry land ryot.

(vii) *Chillies*.—Guntur is the biggest chilli centre with an area of 80,000 acres. Strain 398 evolved at the Agricultural Research station. Guntur is the predominant type and occupied an area of 2,090 acres in the division. Five thousand five hundred and two pounds of pods were distributed. Better yield, persistent, calyx, retentive colour and tolerance to thrip attack are the merits of this strain. Eight acres of seed farms were arranged in the Guntur district. The crop fetched a premium of Rs. 15 to 20 per candy of 500 lb. in the market.

(viii) *Vegetables*.—An impetus was given in this direction for growing more vegetables in all vacant spaces, back yards and favourable localities. Fifty-six pounds of seed and 16,440 packets of different kinds of vegetables were distributed by the department. There was a total area of about 2,000 acres in the division. Tomatoes were very much favoured and were raised as a mixed crop with chillies in the Guntur district under dry conditions. Efforts were made to supply fresh vegetables like cucumbers, etc., both in Krishna and Nellore for the Military.

(ix) *Potatoes*.—It may be of interest to record that potatoes were grown successfully in Repalli taluk of Guntur District over an area of 26 acres. *Great Scot* was the variety tried. An average yield of 3 tons per acre was obtained. A scheme for the extension of the crop to 500 acres to meet the demands of the Military has been sanctioned for the coming year.

(x) *Onions*.—Eleven thousand pounds of Bellary onions were supplied for sowing for civil and Military areas.

8. *Tree planting*.—One hundred and ninety-eight pounds of Korukapalle, 304 lb. of *Prosopis Juliflora* were distributed. In addition planting of *Glyricidia maculata* for green leaf manuring, cashewnuts, casuarina, bamboos and tamarinds were also advocated by the department. Ryots were given advise to plant trees in Government waste lands. Five hundred acres of casuarina were planted in Kandukur taluk.

9. *Fruits*.—Departmental seedlings from Guntur, Kodur and from reliable nurserymen were arranged to those starting new gardens. Seedlings and grafts of mangoes, citrus, grapevines, jacks

and pineapples were arranged. The new area brought under fruit trees was about 25 acres. Judicious method of cultivation, manuring, irrigation and intercultivation and control of pests and diseases were demonstrated in a number of gardens. One thousand one hundred and twenty-eight seed coconuts were supplied from the Agricultural Research Stations.

10. *Soil erosion*.—Special maistris were employed in Bellary district to tackle this problem. In the upland taluks of Guntur, bunding dry lands with the use of bund former, contour sowing, strip cropping and construction of surplus water weirs were done. An area of 6,003 acres was tackled in this direction. The use of bund former was demonstrated over 590 acres.

11. *Fodders*.—The extension of the possibilities in this direction were investigated collaborately in conjunction with the Forest and Revenue Departments. Special Zones were selected for these and were allocated to the local panchayats for execution in the Bellary district. Pillipesara for fodder, Guinea and Napier grass (?) better fodder cholam types like T. 6, G.J. 75, Kolakattai grass, sunhemp were also advocated. The total area under fodder in the division was 133, 040 acres. Sowing of sunnhemp for fodder in the standing crop of paddy a week in advance of paddy harvest, has become a common practice in the delta. Forty-seven thousand five hundred and twenty pounds of seed were supplied in the Guntur district.

12. *Agricultural implements and machinery*.—As a result of war conditions, Iron and Steel were controlled. Materials required for all agricultural tools and implements were stocked by the Department and distributed. Fabricators were appointed and were supplied with materials for manufacturing guntaka blades, mammuties, plough shares, gorru tyres, sickles, etc. Cart tyres and axles, crowbars, spades, barn materials, galvanized and black corrugated sheets and iron wires were obtained under "Trading Schemes". About 600 tons of iron material was disposed in the division.

13. *Subsidiary industries.—Apiculture*.—In places where sufficient pasturage were available ryots were encouraged to maintain Bee hives. They were helped in hiving, proper handling and extraction of honey. There were 351 colonies in the division. A five-year scheme for this item of work was sanctioned in the Bellary district.

Poultry farming of a few important breeds on a small scale was maintained at Kanchela by a private gentleman.

Eri Silk work, coir making, basket making were introduced in Kurnool district.

14. *Seed distribution*.—Good progress was made in this direction in all the districts. With the introduction of special seed multiplication schemes, more seed was made available than in the previous years. Seed farms for all important crops were run and sales effected. The seed farms under paddy was about 4,000 acres.

The following quantity of seed were supplied departmentally in the division :—

	LB
Paddy	72,07,454
Cotton	42,030
Millets	14,23,426
Oil seeds	14,411
Green manure	4,52,686

15. *Loans*.—Government extended the same privileges that were granted last year for loans free of interest in order to encourage ryots to grow more food crops. A special gazetted officer with necessary ministerial and executive staff was sanctioned for this purpose in the Krishna district. Rupees 15,138 for the purchase of implements and Rs. 9,38,976 for the purchase of seed and manure were sanctioned in the year. The loans were mostly paid in kind.

16. *Manures*.—(a) *Farmyard manure*.—Propaganda and demonstration for the proper preservation of farmyard manure by covering manure heaps and pits and introduction of dry earth and trench systems were done as usual. Nineteen thousand two hundred and twenty-five pits and heaps were rectified. Three thousand and thirty-seven dry earth sheds and 3,963 urine trenches were introduced.

(b) *Composting*.—Organic matter and waste material was composted in 418 cases. Pondrette manufacture was undertaken in 63 places by the municipalities and major Union Boards.

(c) *Green manuring*.—Green manuring was advocated chiefly for paddy crop and has become a systematic practice in several places. There was a total area of 2,12,215 acres under the various green manure crop like daincha, wild indigo, sunnhemp, pillipesara and sesbanie speciosa. Four lakhs fifty-two thousand six hundred and eighty-six pounds of green manure seeds were arranged. In places nearing the forest zones, green leaf manuring was done.

(d) *Oil cakes and chemical fertilizers*.—As a direct drive for increased food production, vigorous propaganda was made for the extended use of oil cakes, bonemeal and chemical fertilizers for paddy and other food crops. The grant of takkavi loans, on a large scale acted as a flip for their increased application. Cake purchase from the production centres was taken up and stored in sub-depots of the taluks. The price of cake was controlled ex-mill area and outside both wholesale and retail.

The following quantities of manures were sold in the year :—

	Depot sales.		Licensed dealers.
	TONS.		TONS.
Castor cake	2,707	Oil-cakes	15,042
Groundnut cake	16,037	Bonemeal	138
Bonemeal	109	Chemical fertilizers.	1,481
Ammonium sulphate.	1,192		
Ammonium phosphate.	182		

Calcination of bones was demonstrated in the year at Nellore and Guntur districts and is attracting the attention of ryots.

17. *Pests and diseases*.—The Madras Agricultural Pests and Diseases Act, 1919, was enforced for the control of the following pests and diseases :

(1) *Red hairy caterpillar*.—In Pattikonda and Dhone taluks of Kurnool district. Two hundred and thirty-five acres were tackled.

(2) *Serenopa or the black-headed caterpillar pest of palms*.—In Divi and Bandar taluks of Krishna district 12,500 trees were effected and nearly 8,000 trees were treated.

(3) *Bud rot of palmyrah and coconut palms*.—Repalle, Tenali, Bandar, Vijayavada and Divi taluks.

(4) *Tokra Pest Act*.—In 37 taluks of Nellore, Guntur, Krishna, West Godavari, East Godavari and Visakhapatnam districts. In the year 7 more taluks have been included under the operations of the Act, viz., Yellamanchili, Parvatipur, Vizianagaram, Bobbili, Narasapatnam of Visakhapatnam district, Narasapur and Tadepalligudem of West Godavari district. The District Agricultural Officer on special duty assisted by the Assistant and 27 Fieldmen and 87 demonstration maistries enforced the Act. One lakh ninety-one thousand two hundred and eighty-four acres of tobacco was tackled. Tokra was pulled out and buried in 101,551 pits. Besides tobacco, 8,080 acres of brinjals, tomatoes were also tackled. Five thousand eight hundred and thirty-nine meetings were conducted and 2,750 notices are served.

(5) *Smut control on sugarcane*.—Hospet taluk of Bellary district.

(6) In addition to the above, propaganda and control of the following pests and diseases was carried out in the following cases :—

Thrips on chillies.	Rice hispa.
Epilachna on brinjals.	Cholam smut.
Prodenia on vegetables.	Tobacco damping off.

Two hundred and twenty-eight pounds of copper sulphate, 6 lb. crude oil emulsions, 20 lb. of lead arsanite, $\frac{1}{4}$ lb. of calcium arsenate, and 14 lb. of other chemicals were sold in the division.

18. *Exhibitions and shows*.—Agricultural Exhibitions were arranged during fairs, festivals, cattle shows, "Grow More Food weeks" and other important occasions. The cattle show at Ongole, Nellore District Exhibition, were the major exhibitions. Sixty-two exhibitions and six cattle shows were conducted in the year.

Two magic lantern lectures and 2,297 ordinary lectures were delivered by the staff.

19. *Joint work with other departments.*—In co-operation with Revenue, Co-operative, Public Works Department and National War Front, the department was able to achieve a very satisfactory success in the "Grow More Food" campaign. The collaboration with the Revenue and Co-operative Department was continued in the following cases:—

- (1) Krishna Agricultural Improvement Society, Gudivada.
- (2) Punadipadu Agricultural Improvements and Seed Multiplication Society, Punadipad.
- (3) Agricultural Improvement Society, Nagayalanka.

20. *Agricultural Associations.*—There were 236 Agricultural Associations which conducted 829 meetings. The members of these associations were supplied with iron materials, improved seeds, manures and loans. These Associations were helpful in transmitting the departmental activities to the ryots of the villages. As far as possible the resolutions were given effect to or referred to others for necessary action.

21. *Publications.*—In the year 3,176 villagers' calenders and 31 other publications were sold. The Telugu journal "Padipantalu" was supplied free to all educated ryots, Agricultural Associations and others. This had a very good reception and served the needs of the ryots well. This was of immense help in "Grow More Food" drive.

22. *Special schemes.*—The following special schemes were in operation in the year—

(1) *Ancillary scheme of sugarcane trials at Kapileswarapuram, Krishna district.*—Attempts were made to find out suitable varieties for early mid seasons to enable the extension of the crushing period. It was found 100 lb. nitrogen per acre to be the best manurial dose while 200 lb. nitrogen tends to depress the yield. Wrapping and propping was found to be remunerative and worth expenditure. Co. 421 was found to be the best cane for ratooning, while the popular variety was Co. 419.

(2) *Land Colonizations Schemes.*—Were working in Krishna district in Pedalanka of Kaikalur taluk, Allur Chennanarasapalem and Malkapuram of Nandigama taluk. A report on the working of this scheme was submitted to the Director of Agriculture by the District Agricultural Officer, Vijayavada.

(3) *H. 1. Seed Multiplication Scheme in Bellary district.*—This was run jointly with the co-operative department for seed multiplication and distribution. Three thousand acres of inner area and 19,500 acres of outer area under the seed farms were distributed over Bellary, Guntakal and Adoni taluks.

(4) *Broom rape pest on tobacco.*—A special scheme was enforced in 6 districts of Guntur and Visakhapatnam divisions. A summary of work done is furnished under pests and diseases.

(5) *State Trading Schemes.*—With a view to increase the output of food crops, many sub-depots in consuming centres were opened for the sale of seeds, manure, iron and steel. Paddy seed farms were arranged in the delta over an area of 4,250 acres. Oil cakes and chemical fertilizers like ammonium sulphate and ammonium phosphate were distributed. Nearly 22,000 tons of cake for Guntur and 20,000 tons for Krishna district were the figures aimed for the sale of this paddy to ryots. Seed farms for daincha in 4,000 acres was arranged in Guntur for green manuring purposes. One thousand six hundred and forty-two bags of sunnhemp seed was purchased and moved to Tanjore district. Iron and steel were also brought under the purview of this. Finished articles like cart tyres, axles, spades, pick-axes and crowbars and standard non-standard steel for fabricating was stocked and sold. Small tools and implements for agricultural purposes were also fabricated and sold at controlled prices. Two hundred and eighty tons of standard steel, 1,511 cart tyres, 592 axles and 50 tons of other non-standard steel were sold in the division. One hundred and thirty tons of Barn material were also received for sale.

23. *Agricultural Research Stations in the division—Agricultural Research Station, Guntur—Crop improvement.*—Jonna selections in the punasa and pyru seasons were continued. Only two selections were found to be superior to G.J. 103. Russian cumbu was compared with P.T. 700 but was found poor. In korra 2 out of the 10 strains of the previous year were found to be promising early types. Selection work was done in variga and maize. In chillies No. 398 has been the outstanding strain. In comparative trials No. 1,402 a selection of 398 was found to be better suitable and this is proposed to be multiplied. The work on tobacco was confined to the selection of better types in Harison special. Nos. 72 and 74 were found to be better than the present type H.S. 9. Comparative trials of pulses and seed multiplication of groundnut strains, A.H. 25 and A.H. 45 was carried on.

Agronomic experiments.—Smut control by soaking the seed was conducted in both the seasons. Mixed cropping trial of chillies and cotton was found to be profitable this year, in spite of attack of thrips as against pure crop of chillies. Mixtures of groundnut, sajja, red jonna and fodder jonna with redgram as against pure crops was carried on for a second year. Sowing of Bengalgram in between the rows of tobacco was not favourable.

Manurial experiments.—Different doses of application of nitrogen in the shape of groundnut cake and ammonium sulphate for cotton crop and residual effects of cotton manurial experiments on pyru jonna were studied. Use of groundnuts cake as against cattle manure was found to be beneficial on the principal crops.

Continuous cropping versus rotation experiment and crop yield correlation were continued for third and fourth years respectively.

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In the orchard citrus and mangoes have been come to bearing stage.

Rice Sub-station, Buchireddiplaem.—Improvement of local variety of molakolukulu was the main object of the station. Comparison of seven cultures isolated, with iswarakorra and local molakolukulu for the intermediate season was done. No. 1634 did well. Six cultures under Atragada, 25 cultures of crosses of kamban samba and molakolukulu and 236 single plant selections were tried. In agronomical aspect manurial and cultural experiments were continued. These included use of bonemeal, calcined bone and super phosphate, dry ploughing versus puddle ploughing, time of planting with different ages of seedlings.

Agricultural Research Station, Nandyal.—Cotton selections and N. 14 bulk in 11 acres, jonna selections and agronomic experiments of which 29/68 in 10 acres in a total area of 29 acres and seed multiplication of N.K. 132 to meet the demands of the ryots were the major items of the station. Different kinds of vegetables were grown in 75 cents for collection of seed material.

Agricultural Research Station, Hagari.—The season this year was very favourable for the main Hagari dry crops. 26.08 inches of rainfall were recorded.

The long range experiments (a) with different rotations, and (b) rainfall and yield correlation experiments were continued with a view to find out if the inversion and deep ploughing give better yields in black soils. The experiment laid out in 1942 was continued with the four treatments, viz., deep inversion ploughing, shallow inversion ploughing, shallow non-inversion with country plough and shallow cultivation with guntaka. It is seen from the results that it is not necessary to plough the black soils unless they are too weedy. Trials with bunding and scooping was conducted and the results indicate that bunding is necessarily only in years of low rainfall.

Manurial experiments for cotton with groundnut cake and ammonium sulphate were continued which did not prove their usefulness. Treatment of cholam grain with 'acorus powder' at 2 lb. per 100 lb. of grain had prevented insect damage to stored jonna.

Hybridization work on cotton to evolve better strain than H. 1 was continued. Crosses in jonna to improve the yield of straw and grain in the short duration varieties like T. 1, N.D. 15 was undertaken. Seed multiplication of cotton and millet strains was also attended to.

Summary of large-scale trials in Dry Farming Developmental Research, 1944-45.—By the aid of a grant from the Imperial Council of Agricultural Research, large-scale trials of dry farming improvements were taken up in an area of 500 acres in cultivators' fields near the farm. This is the second year of trial. This year's results were entirely different from the previous years and the

chief reason for this is in the rainfall of the two years. Last year the rainfall was only 13.98 inches while this year the rain fall was 26.08 inches. The rain was more than sufficient for raising good crops both in the areas in which dry farming improvements were tried as well as in areas in which cultivators methods were under trial for comparison, and the improved dry farming practices could not be shown to advantage, while in the previous year (which was a low rainfall year) the improved practices resulted in considerable increases in yield.

This year bunding with the bund former showed no effect on the jonna crop. The yields from different spacings in cotton were equal. The long duration jonna strain T. 1. was better than M. 47-3 the short duration strain, while the latter was better than the former in the previous year. Contrary to last year, bunding T. 1. and bunding narrow spacing gave better results than bunding M.47-3 and bunding wide spacing. It is necessary to continue the trials for some time to arrive at definite conclusions. Contour embanked areas gave consistently good results, the increased yields ranging from 10 to 30 per cent over non-embanked areas.

Office of the D-4, Director of Agriculture, Guntur.

GUNTUR, 24th August 1945. S. VENKATARAMAN,
District Agricultural Officer-in-charge of
Deputy Director of Agriculture.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, CHITTOOR, FOR THE YEAR 1944-45 (FROM 1ST JULY 1944 TO 30TH JUNE 1945).

I. CHARGE.

Sri B. Ramaiah was in charge of the Central Division, Chittoor, till 13th December 1944, when he proceeded on leave for three months and 14 days handing over charge to Sri M. Kanti Raj, District Agricultural Officer, Chittoor. The latter was in additional charge of the division from 14th December 1944 to 19th January 1945. He was succeeded by S. U. Khan, Esq., who held the charge of the division till 27th March 1945 on which date Sri B. Ramaiah, again assumed the charge of the division and continued to be in charge till 30th June 1945.

The outstanding features of the year were—

(1) Reorganization of the districts in the province into five divisions and consequent reallocation of the jurisdiction of the regional Deputy Directors. The Central Division as reconstituted comprises the Districts of Cuddapah, Anantapur, Chingleput, Chittoor and North Arcot. South Arcot and Salem, which formed part and parcel of this division were allotted to Tanjore and Coimbatore divisions, respectively.

(2) Sanction of Personal Assistant Demonstrators to the District Agricultural Officers to cope up with the increased heavy work in connexion with Grow More Food Campaign and to the intensification of sales of manures, iron and steel and seeds under State Trading Schemes inaugurated in the previous year.

(3) The introduction of a scheme for the training of fieldmen and demonstration majstris at the various Agricultural Research Stations to assist the demonstrators in the Grow More Food Campaign.

The following District Agricultural Officers held the charge of the districts in this division during the year under report :—

Headquarters	Name of the officer.	Period held charge.
<i>Anantapur district.</i>		
Anantapur ..	Sri V. N. Subbannacharya ..	1st July to 4th December 1944 and 5th January to 30th June 1945.
Do. ..	Sri K. Venkatraman ..	5th December 1944 to 4th January 1945.
<i>Cuddapah district.</i>		
Cuddapah ..	Sri K. Jagannatha Rao ..	1st July 1944 to 30th June 1945.
<i>Chittoor district.</i>		
Chittoor ..	Sri M. Kanti Raj ..	1st July 1944 to 20th January 1945.
	S. U. Khan, Esq. (Deputy Director in charge).	20th to 24th January 1945.
	Sri K. L. Ramakrishnarao ..	25th January to 6th February 1945.

Headquarters.	Name of the officer.	Period held charge.
<i>Chittoor district—cont.</i>		
Chittoor ..	Sri A. Ramasami Iyer ..	7th to 22nd February 1945.
	Sri T. Rangabrahmarao ..	23rd February to 20th June 1945.
	Janab Mirza Anser Baig ..	21st to 30th June 1945.
<i>Chingleput district.</i>		
Saidapet ..	Sri M. Subramania Pillai ..	1st July 1944 to 28th May 1945.
	Sri M. Gopala Chetty ..	29th May to 30th June 1945.
<i>North Arcot district.</i>		
Vellore ..	Sri M. A. Balakrishnaier ..	1st July 1944 to 23rd March 1945.
	Sri K. Venkatraman ..	24th March to 10th April 1945.
	Sri M. A. Balakrishnaier ..	11th April to 30th June 1945.

For want of trained technical hands a number of taluks in each district were under the additional charge of neighbouring Agricultural Demonstrators and the work in the vacant taluks suffered to a great extent.

II. AGRICULTURAL EDUCATION.

2. There were no departmental institutions in the division during the year imparting Agricultural Education. The district staff, however, gave short lectures on school gardening and practical demonstrations were conducted whenever facilities existed. Special lectures on agricultural and allied subjects were delivered to village officers under training.

III. WAR EFFORT AND GROW MORE FOOD CAMPAIGN.

3. *War effort.*—The officers of the department did considerable propaganda in supporting the war effort by giving a correct picture of the war situation at the Reading Circles and at the meetings convened in the village visited by them. Young and able-bodied men were induced to enlist in the army. A sum of Rs. 4,235-8-0 was contributed towards Defence Savings Fund by the officers and the staff during the year in addition to the contribution of Rs. 7,053 towards Victory loans and small savings campaign. It was also impressed on the minds of the cultivators the absolute necessity of releasing the produce to the public without hoarding and to assist the war effort by bringing uncultivated waste lands into cultivation in order to increase the food production.

4. *Grow More Food Campaign.*—A major portion of the time and energy of the officers and the staff, in the division was concentrated towards the intensification of this campaign to increase the production. Four thousand one hundred and ninety-three meetings of ryots were addressed on the necessity for the increased production of food grains with specific item of improvements to be adopted in each tract. They were also exhorted to bring more land under cultivation, to sink more wells, to use seeds of high yielding strains, to grow more pulses and green manure crops, to adopt judicious and extensive application of manure and to reduce the area under non-food crops like cotton, turmeric and tobacco. To assist the landless

people as well as the poor and deserving ryots who brought waste lands under cultivation, free issue of seeds and manures were made. Prizes in the shape of improved implements, manures and certificates of merit were awarded to deserving ryots who took active part in growing more food crops. A sum of Rs. 8,00,668 was distributed as Takkavi loans free of interest to 12,171 ryots for the purchase of seeds and manures.

In Chittoor district there was an increase in the area under food crops by 23,337 acres over last year and an increase of 39,000 acres under paddy alone over normal. Four hundred and ninety-five tons 1,989 lb. of paddy seeds and 10 tons of 974 lb. ragi seeds were sold departmentally. The district was declared surplus with regard to paddy production.

In Chingleput district, which is a surplus district for paddy, improved paddy strains occupied an area of 1,50,005 acres—an increase by 38,634 acres over last year, which occupies 21 per cent of the total paddy area in the district. Sixty tons 665 lb. of paddy seeds were sold departmentally.

In Cuddapah district due mainly to the unfavourable season there was a decrease in the area under paddy by 18,423 acres than in the previous year but an increase of 26,771 acres over normal. Eighteen thousand and four hundred and eleven acres were under departmental strains of paddy being an increase over last year by 6,677 acres. Forty-seven tons 405 lb. of paddy seeds and 9 tons of millet strains were distributed departmentally. Eight hundred and thirteen acres of uncultivated waste lands were brought under cultivation.

North Arcot district was also a surplus district for paddy. Nearly 48½ tons of paddy seeds were distributed through depots.

In Anantapur district 25 tons 511 lb. of paddy seeds were distributed departmentally and there was an increase of area by 3,814 acres over last year. The total area under departmental paddy strains was 9,021 acres. Millet strains occupied 61,927 acres and 17 tons 1,890 lb of millet strains were distributed through the department. Three thousand six hundred and forty acres of waste lands including tank beds were brought under cultivation.

IV. DEMONSTRATION.

5. *Rainfall and season.*—The rainfall in the five districts that comprise this division during the year under report was as follows :—

District.	Rainfall.		Average rainfall of the district.
	1944-45.	1933-41.	
	INCHES.	INCHES.	INCHES.
Cuddapah	24.95	33.87	28.15
Anantapur	24.35	17.98	22.70
Chittoor	44.78	49.36	39.14
North Arcot	36.25	40.45	38.10
Chingleput	56.45	63.37	45.97

In Cuddapah and North Arcot districts, the rainfall was less than the average rainfall by 3.2 inches and 1.8 inches respectively, while in the remaining three districts, it was above the average.

The South-west monsoon set in early in the districts of Chittoor and Chingleput with a good distribution and was above normal. Sowings of dry crops and planting of paddy were taken up in time. Though the monsoon started early in June with fair amount of precipitation in North Arcot district it waned rapidly into occasional showers creating insufficiency and ill distribution during the later period and consequently dry crops like cumbu, groundnut, cholam, etc., fared badly though the sowings were completed in time. The absence of water in the principal source of irrigation, consequent on the inadequate and poor rainfall was the primary cause for delay in starting paddy cultivation. In Anantapur district the monsoon began shakily in the first three weeks of June but steadied in the last week, when satisfactory rains were received which however did not bring adequate supply to the tanks to start paddy cultivation and consequently the area under paddy crop was below normal. The sowings of Mungari crops were completed by the middle of July. The drought conditions that prevailed in the month of August were not conducive to the successful growth of Mungari crops. In Cuddapah district the monsoon commenced late in June and wet conditions prevailed till the end of the first fortnight of July. Due to insignificant rainfall in May coupled with late rains in June the sowings of green manure crops considerably decreased and a large quantity of green manure seeds were left out. The sowings of early crops like groundnut, cumbu, castor, redgram, etc., had to be done with imperfect preliminary cultivation operations to have seasonal sowings. Sowings of paddy nurseries both under canal and rainfed tank areas commenced simultaneously. But the dry spell that prevailed in August not only affected adversely the early sown crops but the planting of paddy was delayed due to insufficient flow in the canal and want of sufficient supplies in the tanks. With the rains of September transplanting of paddy in the canal area and sowings of cotton and Jonna in dry lands were completed while under tanks planting of paddy commenced.

The North-east monsoon started in time in Chittoor, Anantapur and Cuddapah districts, while it was late in Chingleput and North Arcot districts. The rainfall was above average in Chittoor and all the tanks got filled in, assuring the ryots a second crop of paddy under rainfed tanks. The heavy rains of October and November affected adversely all the dry crops and consequently the yields were reduced. In Anantapur district, the rains were timely and enabled the timely sowings of Hingari crops but were not beneficial to the early sown crops. Consequently the yields of early sown crops went down by 50 per cent. Hingari jonna suffered badly from Sugary disease and yields were much below expectations being only 40 to 50 per cent of normal. The monsoon was weak in the early stages in North Arcot but developed its full force in the third week of November which brought supplies to the tanks. The late receipt of water in the tanks was primarily the cause for the late commencement of Samba planting of paddy resulting in low yield. The heavy rains and the strong winds in November not only interfered with the harvest of groundnut crop, the principal money crop of the tract

but also damaged cholam crop and caused shedding of flowers of redgram. The monsoon started late in Chingleput but was unusually heavy resulting in floods which caused damage to the standing crops of vegetables and Kuruvai paddy. In Cuddapah district the rains were moderate but were more localized in distribution with the result that most of the rainfed tanks received meagre supplies. The supplies to the tanks in this district were not only late for the first crop but insufficient for taking a second crop unlike in the previous year, and the net result was that the paddy area in the district was less than that of the previous year. Bright weather conditions prevailed from January to March which was favourable for harvesting and threshing of paddy, jonna, pulses, etc. In April there was a heavy down pour for a couple of days, in Chingleput district which was beneficial for the Navarai crop of paddy. In Chittoor and North Arcot districts failure of usual summer rains resulted in the reduction of area under Kar paddy.

In 1945 the south-west monsoon was late in all the districts and it is feared the sowings of all the crops will be delayed.

In short, agriculturally the season during the year under report was unsatisfactory.

A. CROPS.

(a) Cereals.

6. *Paddy*.—Paddy is a principal crop cultivated in all the districts under various sources of water-supply. The main improvements advocated for this crop are the extension of area under high yielding strains evolved by the department, reduction of the seed rate in the nurseries, economic, planting and proper manuring.

(a) *Distribution of high yielding strains*.—During the year under report as many as 43 strains were under distribution in the division. Such a large number has become necessary due to the fact that one strain suitable in a particular tract has not fared well even in adjoining taluk. The main varieties under distribution are G.E.B. 24, Co. 2, Co. 5, Co. 14 for Samba season, Co. 17 and Adt. 22 for semi dry conditions, Co. 13 and 18 for Navarai season and Adt. 9, 12 and 15 and Co. 10 for Kar season in the North Arcot district, G.E.B. 24, Co. 14, Co. 15, Co. 19, Co. 20 and M. 2202 for the first crop season and Mtu. 9 for second crop in Cuddapah district, G.E.B. 24, Co. 2, Co. 20 and Mutuant 5782 in Anantapur district, G.E.B. 24, Co. 2 and Co. 14 for the Samba season, Adt. 9 in the Kar season, G.E.B. 24, Co. 19, Co. 17, Adt. 22, Adt. 11, Co. 2, Co. 5 for the samba season, Adt. 9, Co. 13 and Co. 18 in Navarai season, Co. 13 and Co. 19 for Kar season in Chingleput district. Intensive propaganda on extensive scale was carried on to increase the area under paddy and to intensify its cultivation by adequate manuring in order to get increased yields. But unfortunately the unfavourable seasonal conditions that prevailed, stood in the way of getting full benefit of the propaganda. In order to augment seed supply special seed multiplication schemes started in the previous year were continued in addition to the organisation of

seed farms on ryots holdings in other districts. The quantity of improved strains distributed to the ryots through the departmental agency was 1,740,260 lb. as against 759,655 lb. in the previous year. The area occupied by these improved strains through both departmental and natural spread was 436,479 acres as against 333,064 acres. It is in excess of last years area by 103,415 acres, which is about 23.6 per cent of the normal area under paddy in this division. The area under improved strains has increased by 5.6 per cent during the year in the division.

(b) *Cultural*.—Sowing of thin paddy nurseries followed by economic planting was largely advocated in places where there are facilities such as assured water-supply and fixed period of planting. The area under economic transplanting was 279,626 acres as against 228,651 acres during the previous year.

(c) *Manuring*.—Ryots are fully aware that the application of green manure is the cheapest and the best method of manuring paddy. The suitable green manure crops for the division are kolingi, daincha, sunnhemp, indigo and pillipesara. The last mentioned crop has caught the imagination of the cultivators as it serves the dual purpose of fodder and green manure. The total area sown to green manure crops both under departmental and natural spread during the year was 53,474 acres as compared with 58,642 acres of last year. The decrease in area is due to the fact, that in Cuddapah district green manure crops could not be raised due to failure of early rains. The quantity of green manure seeds distributed was 70,341 lb. as against 130,123 lb. of last year. The application of bonemeal and phosphatic manure in conjunction with green manure was popularized. A quantity of 146 tons of bonemeal was supplied departmentally to paddy cultivators. In order to assist the cultivators in procuring the required quantity of groundnut cake and chemical manures to manure paddy, the department under State Trading Schemes made available 13,529 tons of cakes and 2,544 tons of artificials. This was sufficient to manure an area of 96,784 acres.

7. *Millets*.—Cholam, cumbu, ragi, and korra are the important millets cultivated in this division. There were 4 strains of ragi, 17 of cholam, 3 of cumbu and 4 of korra under distribution. The area occupied by these strains during the year is estimated at 99,810 acres. A statement showing the quantity of seed distributed and the area covered including the natural spread is given below :—

District.	Cholam.		Ragi.		Cumbu.		Korra.	
	Quantity of seed.	Area covered.	Quantity of seed.	Area covered.	Quantity of seed.	Area covered.	Quantity of seed.	Area covered.
	LB.	ACS.	LB.	ACS.	LB.	ACS.	LB.	ACS.
Cuddapah ..	11,059	10,430	5,723	1,024	411	..	2,728	770
Anantapur ..	19,250	42,287	9,200	7,604	..	..	11,720	12,196
North Arcot ..	3,711	215	5,078	9,508	1,284	451	..	..
Chittoor ..	1,025	..	23,374	13,568	628	..	..	..
Chingleput ..	1,564	71	94	1,748	..	..	..	..
Total ..	36,609	52,003	41,316	33,390	2,723	451	14,048	12,966

(b) *Sugarcane.*

8. The main items of improvements are (i) popularization of improved varieties (ii) trench and line planting with wide spacing, (iii) proper and adequate method of manuring, (iv) supply of improved cane crushers and (v) construction of Sindhewahe furnaces for boiling of juice. Co. 419 is the most popular variety throughout the division Co. 281 is still popular in North Arcot district where there is water difficulty. To a small extent POJ. 2878 is cultivated in Cuddapah district mostly for chewing purposes. The total area under improved variety of canes was 30,452 acres as against 24,372 acres of last year. Trenching and line planting of cane with wider spacing was done in 30,660 acres during the year under report. Six hundred and forty-eight Sindhewahe furnaces were constructed as against 1,047 furnaces in the previous year. Four hundred and forty-three demonstrations of preparation of good quality of jaggery were conducted.

(c) *Fibres.*

9. H. 1 cotton, a selection from the Westerns, is the popular strain in the two districts of Anantapur and Cuddapah. It has better lint quality and higher ginning percentage than the locals. A quantity of 252,208 lb. of seed was distributed as against 53,469 lb. of last year. The area covered by the strain both under departmental and natural spread was 91,320 acres. In Cuddapah district the area under this crop was 27,252 acres out of 30,000 acres, the area that can be brought under this cotton. It may therefore be said that practically the entire area has been covered and in future the main work is only to keep up the purity of the strain.

A quantity of 1,852 lb. Co. 2 Combodia was distributed in Cuddapah, Anantapur and North Arcot districts. The area sown to this crop was 819 acres.

As a result of the restrictions imposed on the cultivation of pure cotton, the area under this crop has fallen considerably in the main cotton districts of this division.

(d) *Oil seeds.*

10. *Groundnut.*—Improvement of this crop continued, on the same lines as in the previous years by distribution of improved strains. The varieties under distribution are A.H. 25, A.H. 45, A.H. 32, A.H. 698 and A.H. 685. A.H. 25 is popular in Anantapur district while A.H. 25 and A.H. 698 are popular in North Arcot, Chittoor and Cuddapah districts. A.H. 45 is confined to a limited area. The distribution of seed of all these strains amounted to 78,147 lb. and the area occupied both under departmental and natural spread was 15,964 acres.

Gingelly.—The total quantity of improved strains distributed was 204 lb. and the area brought under the strain including the natural spread was 136 acres.

Castor.—In Anantapur district castor strains 59-2-1-1 and 59-8-1 were under distribution. The total quantity of seed distributed was 471 lb. and the total area occupied was 187 acres as against 48 acres of last year.

Coconut.—The chief items of improvements were the distribution of seed nuts and seedlings and advising proper spacing to be adopted while planting. General advice on proper inter-cultivation and raising and ploughing in of green manure crops was also advocated. Two thousand four hundred and seventy-seven seed nuts and 1,378 seedlings were supplied from the Coconut stations as against 1,828 seed nuts and 1,299 seedlings in the previous year.

(e) *Fodder.*

11. The need for growing of crops exclusively for fodder purposes was one of the fundamental items of propaganda by the departmental officers and it may be stated that a very large number of ryots are now setting apart a small portion of their holding for growing fodder crops. The demand for seed and grass slips was met with as far as possible. The following seeds and grass slips were supplied to the ryots during the year :—

Fodder cholam 14,223 lb., pillipesara 3,649, kolukattai grass seed 15 lb., Napier grass seed 4 lb. and 2,000 slips of Napier grass.

It is unfortunate that pillipesara seed was not available to the required extent during the year under report, and consequently its distribution was poor. In the case of fodder jonna seed insufficiency of rainfall in the early part of the year is the cause for the poor distribution.

(f) *Pulses.*

12. Sowing of suitable pulse crop in all available vacant spaces was given an impetus. Farmers were exhorted to sow suitable pulses on the bunds of paddy fields and fallow lands after the harvest of paddy as in the delta tracts of Krishna and Guntur. Sowing of pulses as a mixed crop with other rainfed crops like groundnut and cotton was encouraged. Seeds of all pulses to the tune of 24,450 lb. were distributed.

(g) *Fruits.*

13. Fruits being protective food, extension of their cultivation and need for consuming more fruits were continuously stressed in the departmental propaganda. Advice regarding selection of sites, layout of gradens, proper manuring, inter-cultural practices and pruning of fruit trees was freely given. The demand for grafts of fruit plants from the Fruit Research Station, Kodur, is very great as the growers have fully realized the advantages of raising fruit trees with reliable grafts. The following fruit plants were supplied by the department during the year :—

Citrus	1,194
Mangoes	278
Grape vine cuttings	25
Papaya, plantains and other fruits ..	130

In addition to the above 6,280 mango plants, 1,350 cheeni plants, 500 pappayya, 225 plantain suckers and 400 other fruit plants were obtained from reputed nursery men, and distributed in addition to the planting of 941 acres with cheenies and 666 acres with mangoes.

Ninety-seven sites were inspected for starting new gardens. The proper method of pruning was demonstrated on 6,960 trees. Ring and basin method of irrigation was advocated for 6,148 plants. Fourteen thousand three hundred and thirteen plants were sprayed against deficiency diseases.

(h) *Vegetables.*

14. (a) With a view to meet the increased demand created by the influx of population to towns, a scheme was sanctioned for extending the cultivation of vegetable in and around Anantapur, for a year. Ten acres of vegetable gardens were maintained according to the scheme.

(b) A special farm of 50 acres in extent was started at Nagari in Chittoor district for cultivation of Indian vegetables for supply to the Military. Two crops were raised. In the first crop season 45 acres were grown with vegetables and in the second season 27.09 acres were cultivated. The main vegetables grown were tomato, brinjals, radish, greens, bendai, etc. The supply to the Military was started on 5th August 1944. During the year 563,016 lb. of vegetables were supplied.

(c) In Chingleput district special schemes were run at Kothambakam and Mangadu for the supply of vegetables to the Military over an area of about 464 acres. Of the two schemes Kothambakam scheme was started last year. The total quantity of vegetables supplied to the Military was 670,941 lb. from Kothambakam and 980,783 lb. from Mangadu.

In order to increase the supply of vegetable to towns, propaganda was carried on in and around the towns for its extensive cultivation. As a result of 934 lb. and 20,901 packets of vegetable seeds were distributed. In Madras to cater to the needs of the civil supplies a vegetable scheme was launched which brought in a new area of 320 acres of vacant site and 220 acres of single crop paddy land under vegetables. To meet the seed demand in the city, the vegetable stores at Madras was continued and a quantity of 1,867 lb. of seed of all kinds of vegetables were sold.

Potatoes.—In Chittoor, Anantapur and Cuddapah districts, trials were conducted to see how far the cultivation of potatoes could be introduced in these districts. Twenty-one thousand and sixty-four pounds of potatoes seed obtained from Ootacamund was planted over an area of 20.10 acres. The yield were from 3,000 to 7,000 lb. per acre. Further trials will be continued during the coming year.

Bellary onions.—As the demand for Bellary onions is increasing special attempts were made for the extensive cultivation of this variety in the division. The quantity of seed distribution was 559 lb. in the districts of Anantapur, Caddapah and North Arcot.

(i) *Soil erosion.*

15. Prevention of soil erosion is one of the main methods of increasing the crop production in dry lands as it also conserves soil moisture. Considerable propaganda was done advocating the simple methods of soil conservation such as contour bunding; gully plugging, digging of contour drains with silt trenches, etc., and to prevent soil erosion. Eight hundred and seventeen demonstrations with bund farmers were given and 4,841 acres were bunded. Peripheral bunds were put up over an area of 840 acres. Terracing was done on 37 acres. Hedge planting against erosion by wind was undertaken over an area of 1,817 acres. To consolidate bunds 52,160 Aloe suckers and trees were planted during the year. An area of 51,435 acres were ploughed along the contours.

B. AGRICULTURAL IMPLEMENTS.

One of the main activities of the district staff is the practical demonstrations of improved implements suited to different agricultural operations throughout the division. Cooper No. 11; No. 25, Kirlosker No. 9, No. 11, Gurjar, Zamindar, Karachi, Bar point, P.S.G. No. 6 are the types of ploughs and ridge ploughs, Green Manure Trampler and wet land puddler are the other implements that were in demand but their supply was limited to their availability with the concerned firms. During the year 714 ploughs were sold to the ryots by the department. The statement below gives the number of demonstrations conducted and the implements sold by the department during the year :—

	Sale.	Demonstration.
1 Ploughs	741	5,074
2 Junior hoe	1	10
3 H.M. Guntaka	2	122
4 Bund-former	2	628
5 Triangular Harrow	..	2
6 Buck scraper	..	211
7 Wet land puddler	..	84
8 Basin lister	..	1
9 Mhote wheel	22	393
10 Sugarcane pan	307	..
11 Sugarcane mill	18	84
12 Iron gratings	16	..
13 Sugarcane cutting knives	24	2
14 Spare parts for ploughs	4,482	..
15 Spraying	..	7,430
16 Pruning	7	6,376
17 Wooden paddy grinder	2	129
18 G. S. T. burner	106	1
19 Float lamps	344	..
20 Green manure trampler	..	3
21 Digging and garden forks	..	4
22 Stubble gatherer	..	3

	Sale.	Demonstration.
23 Ridger	..	64
24 Sindhewah furnaces ..	3	84
25 Preparation of jaggery ..	65	232
26 Ring system of irrigation ..	..	2
27 Horticultural implements ..	16	6
28 Iron defectives	199,328	..
29 Green manuring paddy with green manure.	232	..
30 Economic planting	..	225
31 Green manuring with ground-nut cake.	..	2,030
32 Seed drill	..	2
33 Bellary gorru	..	4
34 Chaff-cutter	..	4

C. MANURES.

Farmyard manure.—(i) The conservation of cattle manure received special attention and the district staff continued the propaganda for proper preservation of cattle manure with a view to improve its quality and quantity. This was done by advising the ryots to store manure in pits and cover them regularly with earth and to collect urine by use of dry earth in cattle sheds and construct loose box sheds for stalling of animals. As a result of this propaganda 24,105 manure pits and heaps were maintained on improved lines. Five thousand five hundred and ninety-two dry earth and 510 loose box sheds were constructed.

(ii) The composting of all kinds of farm and habitation waste materials was demonstrated in 474 cases. Composting of municipal rubbish with night soil is being done by a number of municipalities and unions in the division.

(iii) *Green manuring.*—Growing of green manure crops such as Kolingi, Daincha, Sunnhemp, Pillipesara and Indigo has become an established practice in paddy tracts where the conditions are favourable. During the period under report, owing to the adverse seasonal condition that prevailed in early part of the season, the area sown to these crops was less than that of the previous year. The total quantity of green manure seeds sold both by the department and the private dealers was 70,341 lb. and the area occupied was 53,474 acres.

Concentrated manures.—In order to increase the production of foodcrops by the application of manures and to supply manures to the cultivators at controlled rates *State Trading Schemes* were started and manures like groundnut cake, castor cake, ammonium sulphate, ammophos, bonemeal, etc., were stocked in all the taluk

agricultural depots. Further to make them easily available to the cultivators, sub-depots were also opened. The quantity of manures distributed in the division is as detailed below :—

District.	Groundnut cake.		Ammonium sulphate.		Ammonium phosphate.		Castor and neem cakes.		Total area manured.
(1)	(2)		(3)		(4)		(5)		(6)
	TONS.	LB.	TONS.	LB.	TONS.	LB.	TONS.	LB.	TONS.
Cuddapah ..	3,127	713	434	2,201	30	..	14	1,365	24,300
Anantapur ..	2,804	798	112	841	..	..	..	..	16,612
Chingleput ..	4,633	203	1,004	655	20	47	291	40	25,120
North Arcot ..	1,519	1,344	661	784	..	..	..	..	28,422
Chittoor ..	1,138	1,800	275	1,053	5	441	..	..	2,330
Total ..	13,223	378	2,488	1,056	55	488	305	1,445	96,784

D. SUBSIDIARY INDUSTRIES.

Bee-keeping as a cottage industry is fairly popular in the districts of North Arcot, Chittoor and Chingleput. In the other two districts conditions are not suitable to encourage this side line of industry. The central apiary training centre at Chittoor was visited by 423 visitors and training was given to 15 demonstration maistries of the department. Five batches of village masters under training were given practical training in the apiary. At this institution 90 wild colonies were hived of which only 52 were successful. In all 52 colonies were sold to private people and 5 were transferred to Agricultural Demonstrators from this institution leaving 20 colonies at the apiary. Seventeen and three-fourth pounds of honey was extracted at the apiary. In addition to this, assistance was rendered for hiving 133 private colonies. The total number of colonies maintained in the division during the year was 465 and the quantity of honey extracted was 1,219 lb. Nine bee hive boxes were sold.

(b) *Malt-making.*—There are three private concerns at Chittoor preparing ragi malt on commercial scale. There was a great demand for the produce from all the principal towns in the Presidency.

E. PESTS AND DISEASES.

The outbreak of red hairy caterpillar on groundnut and other cereal crops on the whole was mild during the year. In North Arcot and Chingleput districts there was no necessity to enforce the provisions of the Pest Act though the Act was in force. In Chittoor district the pest was brought under control with the enforcement of Pest Act. The sugary disease and rust on cholam appeared rather in a severe form in Anantapur district reducing the yields. The efficiency of treating jonna with sulphur against smut was realized by the ryot population and it is estimated 36,436 acres were sown with treated jonna. The area would have been more but for the fact that the sulphur supplied to Cuddapah and Anantapur districts through the special scheme reached its destination long after sowings were completed. The other pests and diseases controlled during the year were thrips on chillies, dieback gummosis and fruit rot of citrus, leafspot of turmeric, plant lice on citrus and grape vine.

frenching on oranges, nephetis on coconuts, *Epilachna* beetles on brinjals, wilt of tomatoes and brinjals, blast on paddy, etc. The Demonstrators in Entomology and Mycology working in this division attended to 226 calls in connexion with the attacks of pests and diseases on fruit and vegetables crops. Two hundred and eighty-one demonstration of spraying, dusting and other mechanical methods for controlling pests and diseases were conducted by the district staff. The quantity of insecticides and fungicides supplied to ryots was 2,616 lb.

F. LEGISLATION.

(i) *Cotton Ginning and Pressing Factories Act*.—The number of cotton ginning and pressing factories inspected during the year were 20. The owner of one factory at Proddatur in Cuddapah district was prosecuted under section 6 of the Act.

(ii) *Agricultural Pests and Diseases Act*.—(a) The provisions of this Act were enforced in the whole of Siddhout taluk of Cuddapah district prohibiting the use of oil cakes as manure for melon crop grown in the bed of river Pennar as a measure to prevent the annual outbreak of cattle fly pest. This is the second year of enforcement and the pest was successfully prevented.

(b) To control the red hairy-caterpillar pest on groundnuts, the provisions of this Act were in force in the districts of Chittoor, North Arcot and Chingleput. There was no necessity for its enforcement in North Arcot and Chingleput districts but was enforced in Chittoor district.

(c) The Pest Act against water-hyacinth was in force throughout Chingleput district.

(iii) *Mungari cotton cultivation*.—Under the Defence of India Rules the cultivation of pure cotton in the mungari season was prohibited.

(iv) *Compulsory growing of pulses*.—Under the Defence of India Rules, cultivation of one line of redgram to every eleven lines of groundnut and two lines of pulses for every four lines of pure cotton was enforced.

(v) *Groundnut Cake Procurement Order*.—As per G.O. Ms. No. 202, Public (War), dated 20th January 1945, 50 per cent of the cake produced by the millers every month is permitted to be requisitioned by the department. This piece of legislation has been of very great help in the purchase of cake departmentally from the millers.

(vi) Madras Oil Cake Movement Control Order was enforced throughout the year.

(vii) *Madras Manure Dealers Licensing Order*.—This order was in force throughout the year. During the year under report, licences were granted to such of those dealers who were actually producing cake by installing either hand oil-presses or power mills.

G. DEMONSTRATION AND TRIAL PLOTS.

The Agricultural Demonstrators with the assistance of demonstration maistris arranged demonstration plots as usual on cultivators fields to convince them of the superiority of strains, implements, methods of cultivation and manuring pertaining to paddy, millet, cotton and oil seeds. In all, 1859 demonstration plots in the whole division were laid out.

Trial and observation plots.—The superior strains evolved at the agricultural research stations are first tried under local conditions on ryots' lands to ascertain their suitability to the tract and superiority over the local varieties. When the results are satisfactory, they are brought to the notice of the ryots by conducting practical demonstrations in their own lands. There were during the year 516 trial and observation plots.

At the suggestion of the Mycologist, trial plots were laid out in randomized block system with six replications to assess the efficiency of water treatment in controlling the smut disease of cholam. The results indicate that plot sown with the sulphur treated seed was free from smut. The seed soaked in water and dried in the sun was less infected than the one dried in the shade. Sulphur treatment was found to be the best remedy against smut.

H. WORK DONE WITH OTHER DEPARTMENTS.

The officers of this department worked in co-operation with the National War Front Organizations, Revenue, Co-operative, Public Health, Educational and Public Works departments. The district staff often met the Revenue and Public Works department authorities in their jurisdiction to get necessary assistance in connexion with the grow more food campaign. The war propaganda meetings held by the National War Front Organizations and the District Collectors were attended by the district staff and lectures were given on war effort and grow more food campaign. They also participated in all the exhibitions conducted in villages along with other departments.

I. SPECIAL SCHEMES.

The following special schemes were under progress :—

Cuddapah district.—A special seed multiplication scheme on 2,000 acres was run to supply cotton growers of this district with pure H. 1 cotton seed. Sixty acres twenty-one cents were under primary seed farm and 1,917.71 acres under secondary seed farm. The seasonal conditions were not quite satisfactory. By the end of June, 87,810 lb. of seed was obtained. Ginning of seed farm kapas was under progress.

Chittoor—The Paddy scheme.—The year under report was the second year of the scheme. Four hundred and twenty-nine acres of paddy seed farms were arranged and 2,220 bags (160 lb. each) of paddy were purchased. A special staff of 20 demonstration maistris and one clerk were employed under the scheme to run seed farms, etc., and purchase of seeds. A modified scheme was submitted in the light of experience gained for the last two seasons.

North Arcot district—Cumbu seed multiplication.—During the year, 180 acres were sown under seed multiplication scheme—150 acres under P.T. 2229 in Tiruppathur and 30 acres under P.T. 700 in Arni. As the season was most unfavourable, the crop was a failure in both the places. Twenty-three thousand pounds of P.T. 2229 and 1,225 lb. of P.T. 700 seeds alone were available for purchase. Except the cost of seed, there was no other expense. The scheme is now being tried in all the taluks under irrigated conditions and better results are expected.

Groundnut.—For rapid multiplication of A.H. 698 strain, this scheme was started. A quantity of 5,500 lb. of seeds was distributed and the total area was 50 acres. As the season was not quite favourable, the anticipated yield was not obtained. A quantity of 15,466 lb. only was purchased. The scheme will be continued during the coming year.

Colonisation Scheme, Velkanatham.—This scheme was under departmental control from July 1944 to 30th June 1945. On 1st July 1945, it was handed over to the Co-operative department. Agricultural demonstrator Sri M. Gopala Unnithan trained at the Co-operative Institute was in charge from the date of starting till 11th November 1944 when he handed over charge to Sri M. Aligari-swami. From the members of the colony, four were expelled and their places were taken by 4 new members. At present, 42 members are living in the colony out of 53 members. The colonists were given materials for building their houses. A sum of Rs. 2,235 was borrowed from the Central Bank, Vellore and distributed to the members for the purchase of bullocks, sinking wells and clearing old debts, etc.

Sugarcane Ancillary scheme.—A new varietal and manurial experiment on sugarcane was started during the year. It consists of 30 plots of 5 cents each distributed over 30 holdings under varietal treatment. Co. 421 v. Co. 419 which is treated as local and a similar set of 30 plots distributed over 30 holdings under manurial treatment. In the manurial experiments, the local method of manuring is compared with 100 lb. of nitrogen ($\frac{2}{3}$ as groundnut cake and $\frac{1}{3}$ as ammonium sulphate) in addition to 20 cart loads of farm yard manure to be used as basal dressing. The plots were planted in March and the manuring, etc., were done. The condition of the crop is satisfactory.

Chingleput.—The paddy scheme started in the last year for the rapid multiplication of seed was continued during the year. Though a total area of 2,412 acres was programmed under seed farm, only 1,897 acres were sown due to adverse seasonal conditions. A quantity of 9,186 bags of seeds was purchased which will be sufficient to cover an area of 27,558 acres.

J. IRON AND STEEL.

The distribution of iron and steel was taken up by the department and several categories useful for making agricultural implements of all kinds were stocked and sold through the departmental

depots and sub-depots. Cart tyres and axles which were badly needed by the ryots were equitably distributed in all the taluks according to priority and need. It is unfortunate that the supply of tyres and axles were very limited in all the districts in the division, and consequently it has not been possible to meet the needs of a large numbers of cultivators. A total quantity of 678 tons of iron and steel was distributed in addition to the manufactured iron implements like crowbars, pick-axes, etc.

K. EXHIBITION AND SHOWS.

Fifty-five exhibitions were held in connexion with fairs, festivals, conferences, health weeks, and grow more food week celebrations. These exhibitions attracted a very large number of people. A fruit show was arranged at Kodur under the auspices of the Kodur Fruit Growers' Co-operative Society. A cattle show was held for the first time at Lepakshi in Anantapur district. During these occasions, the district staff delivered 1,622 lectures on agricultural improvements. Her Excellency Lady Hope took keen interest in the vegetable stalls arranged by the department at the various exhibitions held at Madras and a silver cup was awarded to the department for the best show put up at the Andhra Mahila Sabha.

L. AGRICULTURAL ASSOCIATIONS.

As stated in the previous year, the object of these associations is to effect agricultural improvements on a large scale and also to give filip to the grow more food campaign. With the help of these associations, various agricultural improvements were pushed through. There were 517 agricultural associations functioning during the year. The district staff explained to the ryots at these meetings the necessity of increasing the area under improved strains and to the proper manuring of the irrigated foodcrops so as to obtain increased yields.

M. LOANS.

During the year, the District Agricultural Officers granted takkavi loans amounting to Rs. 8,01,928 to 12,216 ryots for the purchase of seeds, manures and implements. The amount given for implements was Rs. 1,260. A statement showing the details of loans granted is given below:—

District.	Number of applicants		Amount granted	
	For seeds and manure.	For implements.	Under seeds and manure.	For the purchase of implements.
	(2)	(3)	(4)	(5)
(1)			Rs.	Rs.
Anantapur	1,780	38	98,680	1,855
Cuddapah	1,006	7	60,025	405
North Arcot	1,160	..	74,795	..
Chittoor	7,421	..	5,18,541	..
Chingleput	804	..	48,627	..
Total	12,171	45	8,00,668	1,260

N. PUBLICATIONS.

The number of villagers' calendars, bulletins and other publications sold during the year was 1,083 and 95, respectively, in addition to the free distribution of leaflets.

Agricultural Research Stations.

There is only a demonstration farm in the division at Kalahasti.

Panagal Demonstration Farm.—The season was very late for paddy crops. The nurseries were not sown till late in September. Five acres were under paddy. The varieties being G.B.E. 24, Co. 15 and Mutuant 5782. The following are the yields:—

Name of variety.	Yield per acre.
	LB.
G.E.B. 24	1,514
Co. 2	2,917
Co. 15	2,224
Mutuant 5782.. .. .	1,956

Garden crops.—Ragi crop in both the seasons was satisfactory and recorded 1,780 lb. and 1,008 lb. per acre, respectively. P.T. 700 cumbu was also good and gave 1,040 lb. per acre.

Vegetables.—The following vegetables were grown during the year mainly for production of seeds. The quantity of seed obtained in each case is given below:—

	LB.
1 La lies finger	541
2 Brinjals	10
3 Cowpea	14
4 Radish	23
5 Bottlegourd	7

Dry lands.—Due to extension of acreage under rubbervine the area of dry lands was reduced by 5 acres. Only groundnut came up well with the following results:—

Name of strain.	Yield per acre.
	LB.
A.H. 698	1,132
A.H. 25	556

Chinee budding.—The work was continued as in the previous year. Eight thousand jamberi seedlings were received but for want of good budder much work could not be taken up. Only 1,000 plants were budded during the year of which about 50 per cent were successful.

Rubber vine works.—*Criptostegia grandiflora*. As reported last year 2 acres were transplanted with seedlings. Proper inter-cultivation and irrigation were done. The plots sown with seeds did not do well. Due to rains immediately after sowing a good number of seeds did not germinate. The condition of the transplanted plots was good and is progressing satisfactorily.

Seed distribution.—The following quantity of seed was produced and disposed as shown below:—

Name of seed.	Quantity transferred to districts for distribution.	Quantity sold.
	LB.	LB.
Paddy	17,705	11,898
Ragi	2,210	..
Cumbu	330	..
Vegetable and other miscellaneous	..	420
Total ..	20,245	12,318

Expenditure.—Rs. 3,689-12-11.

Receipts.—Rs. 4,793-0-0.

Programme of work for 1945-46.

Panagal Demonstration Farm.—(a) Area under vegetable will be increased for increased production of vegetable seeds.

(b) Plantain, sugarcane, groundnuts, etc., will be grown as commercial crops to increase the revenue of the farm.

(c) Area under paddy will be increased for increasing the quantity of pure seeds.

(d) Nursery work will be continued to meet the ever-increasing demand of Chinnee budded plants.

2. *Demonstration.*—(a) Reduction in area under cotton cultivation and showing the area so released under foodcrops.

(b) Bringing uncultivated lands under cultivation whenever possible.

(c) Increasing the area by double cropping the lands where irrigation facilities exist.

(d) Extension of areas of improved varieties and strain of paddy, sugarcane, millets, oil seeds, pulses, vegetables. Extension of fruit cultivation, thin sowing of paddy nurseries, economic planting, trenching of sugarcane and introduction of improved practices and measures for preventing soil erosion.

3. *Implements.*—Introduction of improved implements such as ploughs roll easy mhote, wheels, ridgeploughs, buck scraper, sprayers, etc.

4. *Manures*.—Conservation of cattle manure in pits on improved lines preparation of composts with organic waste, extension of green manuring and use of oil cakes and other concentrated manures. Issue of loans for the purchase of seed and manures.

5. *Pests and diseases*.—Control of pests and diseases and demonstration of remedial measures.

6. *Exhibitions*.—Exhibitions, formation of Agricultural Associations, distribution of village calendars and leaflets, sale of bulletins, introduction of subsidiary industries such as poultry, bee-keeping, close Co-operation with Revenue, Co-operative, Veterinary, Health, Public Works Departments and National War Front Associations for introducing all departmental activities.

7. *Seed supply*.—Seed farms for the multiplication and distribution of improved strains of paddy, ragi, will be conducted as usual. Special schemes sanctioned by the Government for multiplication of paddy seed will be continued and also A.H. 698 groundnut scheme.

CHITTOOR,
28th August 1945.

A. GOPALAKRISHNAYYA,
Deputy Director of Agriculture,
Central Division.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, TANJORE, FOR THE YEAR 1944-45 (FROM 1st JULY 1944 TO 30th JUNE 1945).

I. CHARGE.

The Tanjore division consisting of the six southern districts, viz., South Arcot, Tanjore, Trichinopoly, Madura, Ramnad and Tinnevely, was created in G.O. No. 1069, Development, dated 16th March 1945. I opened this new division at Tanjore on the 4th April 1945, and continued to be in charge of it till the end of the official year. Before the creation of the Tanjore division, South Arcot district was in the Central division, Chittoor, and the other five districts were under the Deputy Director of Agriculture, Southern division, Coimbatore. The following statement shows the names of the District Agricultural Officers who were in charge of the districts in this division during the year :—

Headquarters.	District Agricultural officer in-charge.	Number of taluks in the district
(1)	(2)	(3)
	<i>South Arcot district.</i>	
Cuddalore	Janab A. Gulam Ahmed Sahib (1st July 1944 to 16th February 1945). Sri K. Srinivasachari (17th February to 1st March 1945). Sri A. Ramaswami Ayyar (2nd March to 30th June 1945).	8
	<i>Tanjore district.</i>	
Tanjore, Pattukottai.	Sri S. R. Srinivasa Ayyangar (1st July 1944 to 30th June 1945). Janab M. Obaidullah Shah Sahib (1st July 1944 to 30th June 1945).	11
	<i>Trichinopoly district.</i>	
Trichinopoly	Sri G. Sakarama Rao (1st July 1944 to 16th May 1945). Sri N. Subramania Ayyar (17th May to 30th June 1945).	7
	<i>Madura district.</i>	
Madura	Sri T. G. Anantharama Ayyar (1st July 1944 to 30th June 1945).	8
	<i>Ramnad district.</i>	
Sattur	Sri K. Avadainayagam Pillai (1st July 1944 to 30th June 1945).	9
	<i>Tinnevely district.</i>	
Tinnevely	Sri T. G. Muthuswami Ayyar (1st July to 23rd October 1944). Sri A. Ramaswami Ayyar (24th October to 7th December 1944). Sri V. K. Subrahmanya Mudaliyar (8th to 14th December 1944). Sri T. G. Muthuswami Ayyar (15th December 1944 to 30th June 1945).	8

H. AGRICULTURAL EDUCATION.

The Juvenile School attached to Agricultural Research Station, Palur (South Arcot), continued to work satisfactorily throughout the year. At Aduthurai and Pattukottai (Tanjore district) Research Stations 25 candidates were given maistries training for over eight months and thereafter employed in the department. The three institutions at Mayanoor, Mahimaipuram and Sendurai in Trichinopoly district, continued to impart practical agricultural education through the farms attached to each. Agriculture was continued to be taught as a C. Group subject for S.S.L.C. in the High School at Pasumalai at Usilampatti. The subject was also taught in the Mangalapuram Girls' High School and Madura Training School in Madura district. The Rajapalayam Board High School (Ramnad district) had agriculture as C. Group in the curriculum. Regular gardening was taught in the Raja High School in Sivaganga. The District Board High School at Koilpatti had Agriculture as an optional subject as in previous years. The students supplemented their knowledge by visiting the Agricultural Research Station, Koilpatti, frequently. Instructions in vegetable gardening was being given in Koilpatti and Tinnevely Training Schools.

III. DEMONSTRATIONS.

Season and Rainfall.—The South-west Monsoon of the fasli year was feeble in all the districts except in Ramnad. It was late in Madura, Trichinopoly, Tinnevely and Tanjore districts, and in time in South Arcot and Ramnad districts. Preparatory cultivations of the black soils and sowings of red soil in South Arcot and Ramnad districts, were taken up in time while in others they were delayed. In Tinnevely major portion of the rains in this period was received only in September and there were no freshes in the river. The area under kar paddy was reduced in Tinnevely and Madura and yield too was below normal. In other districts the area and the yield were normal. The stand of dry crop was fair.

The North-east Monsoon was late in all the districts excepting Tinnevely and was heavy. The months of November and December unusually brought heavy rains and the tanks in all the districts were full to the brim. Samba paddy planting was delayed while its area increased considerably in the tank-fed tracts. But the excessive rains during November and December affected adversely the paddy crop particularly along the coastal tracts due to the flooding and submersion and in other areas where the crop was in flowers. The dry crops, which suffered first for want of sufficient rains, were later badly affected on account of excessive rains. Cotton, groundnut, cumbu and cholam could not be intercultivated or weeded properly due to continued wet weather. The growth was stunted and consequently the yields were poor.

The cold weather was practically rainless and this helped the harvest and drying of paddy and other crops. However this affected late sown gingelly, groundnut, cotton crop, garden crops, and navarai paddy crop in tank-fed areas where the water-supply had run out.

The summer rains were disappointing in Tanjore, South Arcot and Trichinopoly, but were fairly normal in Madura, Ramnad and Tinnevely districts. In the latter districts dry lands were ploughed and brought to good tilth for the ensuing season. In Tanjore Cauvery-Mettur Project Area for want of moisture in the soil reclamation work was retarded and the growing of green manure crops was delayed.

The distributions of rainfall from the agricultural point of view was far from satisfactory. They were in deficit when required and in excess when not required and thus reduced the yields. The total fall for the year was more than the previous year in almost all the districts, but the distribution was unfavourable and uneven.

A. CROPS.

(a) Cereals.

Paddy.—This staple foodcrop received special attention during the year. Every effort was made to increase both the area and yield. In the Cauvery-Mettur Project Area, Tanjore district, special Agricultural, Revenue and Irrigation staff were posted to reclaim and bring more than 40,000 acres of waste lands under paddy. Raising of two crops of paddy where one was raised before was advocated and adopted. To increase acre yield all the improved and intensive cultivation methods, such as large scale multiplication and distribution of improved paddy strains, growing of green manure crops extensively, extensive application of oil cakes and fertilizers, and adoption of improved methods, such as proper raising of nursery, proper method of planting, use of suitable varieties for alkaline or water-logged areas, adoption of control measure against pests and diseases, etc.

Distribution of improved strains.—All the improved strains suitable to the tracts and in use widely, were multiplied in large quantities and distributed. In order to cover a very large area with improved strains, paddy seed multiplication schemes to produce large quantities of pure and good seeds were continued in South Arcot, Tanjore and Tinnevely and started afresh in Trichinopoly and Madura.

Eleven thousand one hundred seventy-six acres of seed farms were run and 5,626,388 lb. of seeds of improved strains were produced and distributed during the year. As a result of this large scale distribution of improved strains an area of 176,250 acres was brought under departmental varieties.

Methods of cultivation.—The improved methods consisted mainly in advocating the use of cheap labour-saving implements like light iron ploughs, Burmese Settun, the puddler and the leveling board. Added to these, the use of the hand levelling board to level the narrow strip of "cent nurseries" was also in vogue. These implements are becoming increasingly popular in all the paddy growing tracts in spite of the high prices.

By adoption of these nurseries large quantities of paddy seeds were saved from being wasted in raising nurseries. The seedlings produced from such nurseries were robust and the yields obtained by planting them in two were good. Close spacing according to the age of crops and planting in two was advocated against bunch planting and long spacing prevalent.

The raising of the cent nursery where 1 to 1½ Madras measure of seed is sown in 1 cent with drainage channels all round is gaining more importance in Tanjore district.

Manuring.—The surest way of increasing a crop yield is by adequate manuring. The use of cattle manure and green leaf are very well known but their availability is limited. Propaganda was done for the proper preservation and application of cattle manure. Every effort was made to popularize the growing of green manure crops. As a result, there was great demand for green manure seeds and to meet this demand large quantities of seeds were arranged to be purchased in and outside the division. The ryots were induced to collect seeds from their own green manure crops and seed farms were arranged to meet the increasing demand.

As usual Kolinji, Daincha and Pillipesara were popular and their areas are on the increase, the only limitation being the availability of seeds. The demand for seed can be very well imagined by the price of Kolinji seed rising to Rs. 18 per bag which was previously sold for Rs. 5 or 6, and even at this high rate seeds were not available.

In the Cauvery-Mettur Project area (Tanjore) a scheme of free distribution of green manure seeds and their compulsory growing in the areas newly reclaimed in faslis 1353 and 1354 was launched as per G.O. No. 558, dated 10th February 1945. Accordingly 767, 578 lb. of various green manure seeds were distributed free to cover a newly reclaimed area of 35,000 acres.

Eleven lakhs five thousand eight hundred and fifty-seven pounds of seed of all varieties to cover 73,724 acres were distributed through the department while sale by outsiders and natural spread is expected to have covered 488,863 bringing the total area to 562,587 acres.

Application of oil cakes, bonemeal and fertilizers, etc., was given a great impetus to increase the crop yields, particularly paddy. Fixing of ceiling price for oil cake particularly groundnut cake, bringing it under departmental control and distribution by zonal system was a great boon to the ryots. The total sale of groundnut cake was 10,300½ tons sufficient to cover 72,100 acres.

The distribution of bonemeal by the zonal system kept down the prices and made the stock available for the paddy growers. A total quantity of 155 tons of bonemeal was sold to cover 6,186 acres.

The supply of ammonium sulphate, super and ammonium phosphate, though late, was availed of in the double crop areas to a large extent. The 25 per cent subsidy granted by the central Government towards the cost of ammonium sulphate attracted the

attention of the ryots and this manure was in great demand and was used extensively. The total sale of ammonium sulphate and phosphate was 7,527 tons to cover 378,850 acres.

Pests and diseases on paddy and consequent reduction in yield.—Stem borer, Soorai, and blast caused damage in Tanjore district, the worst affected being the Cauvery-Mettur Project Area. The inclement weather and the incessant rains of October and November lodged the crop in many places when in short blade. Consequently the flowering was not normal and the grains did not set properly.

The estimated loss on the whole may not exceed 10 per cent and during the coming year arrangements are ahead to distribute resistant varieties as much as possible.

Cholam.—Improved strains like A.S. 2095, 29, 389, 1343, 2089 and 1595 were popular and a total area of 1,043 acres was covered with these strains.

Ragi.—In spite of E.C. 593 being superior in yield to other varieties, its longer duration stands in its way or rapid spread. In Tinnevely district E.C. 24 is becoming popular. In other districts short duration varieties, like E.C. 3570, 3735 are getting popular and have bright future. Six thousand nine hundred and ninety-four pound of ragi seeds to cover 3,500 acres were distributed during the year.

Cumbu.—This crop, being the main cereal crop of the black soil area of the Southern districts KC. 8. 105 and 458 were multiplied and distributed in the tract where these are popular. The other varieties 409, 700 and 720 find favour with the ryots of Mathurai, Trichinopoly and South Arcot districts. The total distribution of the improved strains during the year under report was 13,658 lb. which is sufficient to cover an area of 2,500 acres.

Wheat.—The awnless Pusa Type tried with the local samba at Kodai hills did not fare well.

(b) Fibre.

Cotton.—Cotton is the only important fibre crop in the division. Cambodia and Karunganni are the chief varieties extensively grown in this division.

Cambodia cotton.—In Cambodia cotton, Co. 2, Co. 3 and Co. 4 are the important strains grown in all the districts excepting Tanjore, of this division. Among these strains, Co. 4 is finding special favour and is very popular for raising in Masipattam. A scheme for multiplication of seeds was run in Srivilliputhur (Ramnad district). For large scale multiplication and distribution of these strains, 24.5 acres of seed farms were run and 200,086 lb. of seeds were distributed. It is estimated that improved strains of Cambodia cotton occupied 194,789 acres during the year and 21,619 acres were sown in lines.

Karunganni.—K.1. strain of this variety is grown extensively in all the black cotton soils of this division. It continues to be popular,

and to meet the full demand of seeds, a scheme for its multiplication in Tinnevely district has since been sanctioned. Seed farms of 3,759 acres were run during the year and 297,324 lb. of seeds were distributed. Twenty-nine thousand six hundred forty-two acres have been sown in lines.

(c) *Sugarcane.*

Sugarcane is grown in fairly large areas in South Arcot, Trichinopoly and Madura districts. Co. 419, 421, 281, 349 and POJ 2878 are the important varieties grown. Most of the area under sugarcane is under improved varieties. Fifty-six thousand sets were distributed by the department and 2,300,000 sets by private agencies.

Trench planting, proper spacing, judicious application of manure, use of improved mills and construction of improved furnaces were popularised. Improved methods of planting were demonstrated in 20,449 acres. One thousand three hundred forty-five improved furnaces were constructed.

(d) *Fodder.*

Propaganda was done for growing fodder crops of different kinds and the concessions granted by the Government were explained to the ryots. Nine thousand one hundred and fifty-five pounds of seeds of fodder crops and 27,300 slips of fodder grasses were distributed during the year. The department also undertook to procure cotton seed for cattlefood from outside the province and stocked for sale at the depots. The total quantity so obtained and sold was 5,474,653 lb.

(e) *Fruits.*

Propaganda for growing fruit trees, particularly grafts, was carried out. Advice on the proper maintenance of existing gardens, starting of new gardens in suitable soils, giving proper spacing, correct method of planting, manuring, after cultivation, etc., was given. There was increasing demand for fruit plants. As the departmental fruit stations could not meet the demand fully, many people got grafts and budded plants from well known nurserymen in the province. During the year under report the following number of fruit plants were distributed :—

Sapota	26	Mango	2,044
Jack	250	Sathugudi orange ..	413
Pineapple	161	Lime	227
Pomegranate	15	Other fruit varieties	81

The second Tamil Nad Fruit Show and the First Mango Fruit Show were held in Trichinopoly and Bikshandarkoil respectively. These shows attracted large crowds.

(f) *Vegetables.*

Civil supplies.—Grow More Vegetable campaign was intensified during the year. As a result an area of 3,387 acres under vegetables of all kinds was grown. Agriculturists and non-agriculturists took

interest in growing vegetables in houses, offices, school compounds and in suitable vacant-sites. The demand for vegetable seeds from all quarters was great. One thousand seven hundred and thirty-three pounds of seeds of all kinds, 54,750 seedlings, 6,353 suckers and 65 cuttings were supplied during the year.

Military supplies.—The following schemes to supply vegetables to the military continued to function satisfactorily :—(i) Military supply scheme at Ettarai (Trichinopoly) to supply 6,000 lb. of Indian vegetables per day, (ii) Military supply scheme at Hiranyamangalam (Trichinopoly) to supply 1,000 to 2,000 lb. of Indian vegetables per day, (iii) Military supply scheme at Kodaikanal (Madura) to supply 2 tons of English vegetables per day.

Onion scheme.—Schemes for the supply of 3,000 tons per year of Bellary onions to the military were started during the year (in April) one in Trichinopoly and another in Madura. Preliminary work of the selection of ryots and lands was completed and supply would start from July onwards.

Potato scheme.—Extension of the area under potatoes in Kodaikanal taluk was brought about by the permanent assignment of lands to the extent of 137 acres during the year. Seed farms were run in 39 holdings and 2,600 maunds (of 25 lb.) of seed potatoes were distributed. Sixty-six tons of potatoes were supplied to the army.

(g) *Oil seeds.*

Groundnut.—The strains of AH. 25,698 and 32 are finding favour with the ryots. Schemes financed by the Imperial Council of Agricultural Research for the multiplication of AH. 25 groundnut in (30 acres) in Madura district, for AH. 698 (78 acres) in South Arcot district were started. One hundred and fifty-three acres of seed farms in this division were run and 39,901 lb. of seeds of above strains were distributed.

Gingelly.—S.I. 89 gingelly is becoming popular in the division 686 lb. of seeds were distributed during the year.

Castor.—This is generally grown mixed with other dry and garden crops or as fence lines. The strain RC 59-2-1-1 is becoming popular in South Arcot district and R.C. 59 in Ramnad.

Cococnut.—This is fairly important in Tanjore district. The demand for good seed nuts and seedlings was great. The supply was met partly through nurserymen in Adirampatnam who distributed several thousands of seedlings. Two thousand two hundred and thirty-nine seednuts, 16,464 seedlings were distributed during the year.

Pulses.—Intensive propaganda was carried out in all the districts for a large scale expansion of the area under pulse crops. The ryots were advised to grow these crops in gardens, on field bunds, as a catch crop after paddy and as a mixture with other crops. A grow more pulse scheme was launched and red, black and greengram

seeds were distributed free for raising in new areas by the Pulse Specialist. The following quantities of seeds of various pulses were distributed :—

	LB.
Greengram	31,819
Blackgram	50,150
Redgram	15,032
Other pulses	1,088
Total ..	98,089

Miscellaneous.

Pyrethrum.—Forty-five acres were planted in Kodaikanal Hills. The yield from the same is estimated to be 25 tons of flowers. The pyrethrum content of the flower was 0.029 per cent being highest ever recorded.

Rye.—The trial plots conducted in growing rye for ergot production in Kodaikanal Hills were a success. It is proposed to have 5 acres under rye in the coming season.

Casuarina plantation for fuel.—Propaganda was done for increasing the area under casuarina. Four lakhs and fifty thousand seedlings were distributed and about 500 acres were planted during the year.

Babul cashewnut, etc.—One thousand and thirty-three pounds of Babul pods in Tinnevely district were collected and distributed for sowing on tank beds.

B. IMPLEMENTS.

The demand for implements of various kinds could not be met fully because of their scarcity in the market. The iron and steel for the manufacture were in short supply and their prices, shot up very high. The department under the State Trading Scheme came to the rescue of ryots. It undertook to get iron and steel materials, to manufacture tools and implements and to supply at controlled rates.

The number of demonstrations conducted and sales effected of various implements are given below :—

Kind of implement.	Number of demonstrations.	Sales.
Mould board ploughs	5,624	999
Other labour-saving implements	11,234	471
Spares	..	2,049

C. MANURES.

Proper preservation of cattle manure and conservation of urine continued to be an important item of propaganda composting of

organic waste and street rubbish with and without nightsoil in municipalities, panchayats and in rural areas was also effected. Twelve thousand six hundred and eighty-nine pits were dug. Eleven thousand nine hundred and thirteen pits were rectified. Seven thousand two hundred and one manure heaps were covered with earth or tank silt. Ten thousand four hundred and thirty-five dry earth sheds or litter beds were made. Composting of municipal rubbish with nightsoil was demonstrated in 425 places and 1,171 ordinary compost pits for organic wastes were laid.

Green manure.—Vigorous propaganda was done to grow green manure crops in situ for paddy and other crops and when possible to collect seeds. The following were the quantities of green manure seeds of different varieties distributed :—

	LB.
Kolinji	143,882
Dhaincha	203,981
Sunnhemp	624,482
Pillipasara	72,759
Indigo	58,886
Sesbania	1,706

Fertilizers.—Oilcakes and inorganic manures were purchased in large quantities under State Trading Schemes, stocked and sold to ryots at controlled rates. In connexion with Grow More Food campaign this was given great attention. The following quantities of various manures were sold during the year :—

Groundnut cake	206,009 cwt.	10,300 tons.
Ammonium sulphate	}	150,539 cwt.
Ammonium phosphate		
Superphosphate		
Fish guano	151 cwt.	
Bonemeal and bonesinews	3,158 cwt.	

D. PESTS AND DISEASES.

Soorai and blast affected paddy crop seriously in Tanjore district. Epilachna beetle caused severe damage to brinjal in parts of Ramnad and Madura districts. There was no other serious outbreak of pests and diseases in other districts. Control and preventive measures against the serious pests and diseases were taken to check them. The following were the demonstrations and sales of insecticides and fungicides during the year :—

	Sale.	Demonstration.
Sprayers	10	484
Light traps	..	348
Flooding nurseries	..	983
Copper sulphate	450½	..
Calcium and lead arsenate	140	..
Fish oil soap	250½	..
Others	26½	..

Pest Acts.—The combodia cotton pest act was in force in Madura and Trichinopoly districts. Eradication was completed before 1st September 1944 in major portion of the area except a small extent of 735.5 acres. Thirty-one defaulters were warned and no prosecutions were launched—

(i) Cotton Control Act against Pulichai was in force in Tinnevely and Ramnad districts.

(ii) The Wheat Rust Act which prohibited the sowing of wheat in summer at Kodaikanal was lifted.

(iii) Pest Act against water hyacinth was in force throughout the Tanjore district, parts of Madura and Tinnevely.

(iv) Red Hairy Caterpillar Pest Act was in force in Madura, Trichinopoly, Tanjore and South Arcot districts and the usual control measures were adopted. The attack was mild during the year.

E. DEMONSTRATIONS.

Four thousand seven hundred and fifteen demonstration plots and 593 trial plots were laid during the year to convince the ryots of the superiority of strains or departmental methods of cultivation in various localities.

F. WORK WITH OTHER DEPARTMENTS.

Close co-operation was maintained with Revenue, Public Works Department National War Front and Co-operative departments particularly in the Grow More Food Campaign and in bringing waste lands under food crops. The Municipal and Health Officers were given assistance in composting the town refuse. The various concessions granted by the Government were brought to the notice of the ryots and they were urged to take full advantage of these concessions and to help the war efforts. The District Agricultural Officers attended the periodical conferences of district officers food council, meetings, meetings of National War Front, irrigation meetings and enlisted the co-operation of the above departments.

G. EXHIBITION AND SHOWS.

One hundred and twelve agricultural exhibitions were put up during the year. Four thousand eight hundred and thirty-nine lectures without magic lantern and 14 with magic lantern were also delivered.

H. AGRICULTURAL ASSOCIATIONS.

Ninety-two agricultural associations were newly started during the year and there were 394 such associations functioning in this division. All these associations were taking interest in adopting improved agricultural practices. Nine hundred and thirty-one meetings were held during the year and suitable action was taken on the resolutions passed at these meetings.

I. LIVESTOCK.

The District Staff carried on propaganda on the correct feeding and maintenance of livestock and made arrangements for the supply of seeds of fodder crops and grass slips. Advice on poultry rearing was also given freely by them.

J. SIDELINES AND COTTAGE INDUSTRIES.

Agriculture.—Bee-keeping and poultry rearing were advocated as side lines. Three hundred and seventy-three demonstrations on bee-keeping, 695 on honey extraction were conducted. There were 4,515 hives working during the year. Nine thousand nine hundred and thirty-nine pounds of honey were extracted and 540 new colonies were formed. Instructions on the proper maintenance of apiaries and poultry rearing were given to ryots.

K. LOANS.

Loans for purchase of seeds and manures.—Large sums were distributed under this head and there was great demand for these loans from the ryots. A sum of Rs. 6,52,089 was distributed to 9,521 applicants during the year.

Loans for the purchase of agricultural implements.—A sum of Rs. 11,197 was granted to 308 cultivators for the purchase of 872 agricultural implements of various kinds.

L. PUBLICATIONS.

Eleven thousand seven hundred and sixty-three village calendars and 434 other priced publications were sold during the year besides a large scale distribution of leaflets and posters of various kinds to stimulate the interest of the people in the Grow More Food Campaign. The journal Mezhi Chelvam was much appreciated by the ryots.

M. CONTROL OF SOIL EROSION.

The evil effects of soil erosion were explained to the ryots and they were urged to adopt the remedial measure advocated by the department, viz., bunding and levelling, putting up of field embankments, terracing, contour ploughing, tree planting, digging contour drains, etc. The use of bund formers to check soil erosion and conserve moisture, contour ploughing and levelling with buck scrapers were appreciated. Seven hundred and eighty-six acres were terraced.

N. GROW MORE FOOD CAMPAIGN.

Grow More Food Campaign was in the fore front of all the items of work of the district staff in the division. Vigorous propaganda was done to increase the area under food crops both intensively and extensively. All possible efforts were made to increase the production of foodgrains, vegetables, pulses and fruits. The several

concessions granted by the Government were brought to the notice of the cultivators at all meetings and they were availed of in increasing measures by the people.

The trading schemes for the purchase of seeds, manures, cattle food and iron and steel were continued to work during the year. Large amounts were placed at the disposal of the department by Government. With this, amount, it was possible to buy and distribute the above materials in very large quantities.

Special schemes for the increased production and supply of English and Indian vegetables were sanctioned during the year under report. Special staff for carrying out these schemes was also sanctioned. Considerable progress has been achieved in the working of these schemes.

Madras Manure Dealers' Licensing Order of 1943 was promulgated and as a result of licensing the traders and fixing the ceiling price of manures, it has been possible to arrest the rise in price and regulate the equitable distribution of the manures available in the country. Six thousand one hundred and twenty-six applications were received for licences and 5,045 licences were issued during the year under report.

The district staff participated in all war efforts in the district and helped the other departments in this work in collecting donations for war purposes, in addressing meetings on recruitment, savings campaign, etc.

As a result of all these activities during the year for furthering the "Grow More Food Campaign" and "War Efforts" the following are the achievement:—

Number of food committees formed newly 154.

Number of meetings held—1,782.

Number of public and War Committee meetings—377.

Lectures given on Grow More Food campaign—5,053.

Amount collected for war fund, including Defence Savings Movement, Cash Certificates, Stamps, Hundi collections, etc.—Rs. 17,004-14-2.

Estimated area of waste lands brought under food crops and vegetables 61,840.5 acres.

Area of single crop lands converted into double crop lands—69,129 acres.

Estimated area of new lands assigned for food production—54,996 acres

Increased area brought under food-crops during 1944-45—200,075 acres.

Quantity of improved strains distributed and the area covered by them (cereals).

	LB.	Area in acres.
Seeds	5,626,388	176,250
Vegetable seeds—		
Onion seeds	625	3,281
Potato seeds	82,192	
Other seeds	979	
Seedlings—		
Tomato, etc., seedlings	54,750	3,281
Suckers	6,303	
Cuttings	650	

11. Quantity of manure distributed and area manured.

Quantity in tons.	Area in acres.
17,992 17 cwt.	462,925

12. Percentage of increase in the production of food crops as compared with the previous fasli.—Five per cent excepting Tanjore district due to pests and diseases.

Brief programme of work for 1945-56—Tanjore division—
for food-crops.

	ACS.
1 Area under improved paddy	2,000,000
2 Economic planting	1,260,000
3 Green manuring	750,000
4 Application of oilcakes and fertilizers	500,000
5 Cholam improved strains	20,000
6 Ragi	25,000
7 Cumbu	50,000
8 Other minor millets	100,000
9 Pulses	500,000
10 Sugarcane	10,000
11 Vegetables and fruits	20,000
12 Potatoes	200
13 Sweet potatoes	10,000
14 Paddy seed farms proposed	7,000
15 Wheat and barley	100

TANJORE,
7th August 1945.

S. U. KHAN,
Deputy Director of Agriculture.

ADMINISTRATION REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, COIMBATORE, FOR THE YEAR 1944-45 (FROM 1ST JULY 1944 TO 30TH JUNE 1945).

I. CHARGE.

The Southern Division, Coimbatore, which had the nine districts of Coimbatore, Nilgiris, Malabar, South Kanara, Tanjore, Trichinopoly, Madura, Ramnad and Tinnevely till the end of April was split up into two divisions; one with headquarters at Tanjore with the last mentioned five districts and South Arcot district added on and the other at Coimbatore with the first four districts and Salem added on with effect from 4th May 1945. I held charge of the Southern Division from 1st July to 18th October 1944 and again from 13th January to 3rd May 1945 and Mr. Saadat-ulla Khan from 19th October 1944 to 12th January 1945 when I acted as Paddy Specialist. I held charge of the reconstructed Coimbatore Division from 4th May to 30th June 1945.

The following statement gives the names of the several District Agricultural Officers who held charge of each of five districts included in the Coimbatore Division together with the number of taluks in each district:—

Head quarters.	District Agricultural Officer in charge.	Number of taluks in the district.
(1)	(2)	(3)
<i>Coimbatore district.</i>		
Coimbatore ..	Sri N. Subramania Ayyar (1st July to 5th December 1944).	10
	Sri S. S. Katchapowara Ayyar (6th December to 15th December 1944).	
	Sri A. Ramaswami Ayyar (16th December 1944 to 30th January 1945).	
	Sri N. Subramania Ayyar (31st January to 8th May 1945).	
	Sri M. P. Sankaran Nambiyar (9th May to 30th June 1945).	
<i>Nilgiris district,</i>		
Ootacamund ..	Sri P. A. Nathan (1st July to 4th December 1944 and 23rd December 1944 to 30th June 1945).	3
	Sri S. Madhava Rao (5th to 22nd December 1944).	
<i>Malabar district.</i>		
Calicut ..	Sri M. P. Sankaran Nambiyar (1st July 1944 to 3rd May 1945).	9
	Sri A. Gopalan Nayar (4th May to 30th June 1945).	

Head quarters,	District Agricultural Officer in charge,	Number of taluks in the district,
<i>South Kanara.</i>		
Mangalore ..	Sri K. K. Raghavan (1st July 1944 to 15th January 1945).	6
	Sri K. Venkatraman (16th January to 6th February 1945).	
	Sri K. K. Raghavan (7th February to 26th June 1945).	
	Sri G. Sakkaram Rao (27th June to 30th June 1945).	
<i>Salem district.</i>		
Salem ..	Sri S. Dharmalingam Mudaliyar (1st July to 15th September 1944).	10
	Sri A. Ramaswami Ayyar (16th September to 15th October 1944).	
	Sri S. Dharmalingam Mudaliyar (16th October 1944 to 22nd May 1945).	
	Sri N. S. Rajagopal Ayyar (23rd May to 30th June 1945). Personal Assistant incharge.	

II. AGRICULTURAL EDUCATION.

Agriculture was taught as an optional subject in the High Schools at Bhavani and Peelamedu in the Coimbatore district. The teaching of this subject had to be suspended in the High School at Gobichettipalayam for want of a qualified instructor. A course of 12 lectures on Agriculture was given to the students at the Summer School of Rural Uplift at Attur in Salem district organized by the Special Development Officer, Salem.

Training of Probationary Agricultural Demonstrators.—A batch of 37 freshly recruited Agricultural Demonstrators was given a month's intensive practical training at the Agricultural College from the 12th of June 1945 in maintaining various accounts, books and records connected with their work as well as in demonstration and propaganda work in the villages. It is hoped that this training will continue to be given to future entrants in the department and that it would enhance the efficiency of the Demonstrators right from the start of their career.

III. DEMONSTRATION.

Season.—The south-west monsoon started in time in the West Coast districts of Malabar and South Kanara but was very weak during the four months from June to September when the first and the major paddy crop of the year is grown with the result that the crop in both the districts was below normal.

The north-east monsoon rains were quite good in Malabar district but were not so good in the South Kanara district. The second crop in Malabar gave normal yields while due to insufficiency of rains, this crop gave yields slightly below normal in the South Kanara district.

The hot weather rains were fairly normal in both the districts except in the month of May and as a result the early sown paddy nurseries had a very hard time, indeed in both the districts. For want of sufficient sowing rains in May, sowing of first crop of paddy was held off till very late in June 1945 as the south-west monsoon arrived rather late.

The total rainfall in the Nilgiris district was below normal and very unevenly distributed. The summer showers and the south-west rains were greatly in deficit. The irrigated crop of potatoes and vegetables in summer months suffered greatly from the continued drought and the inadequacy of water-supply in the irrigation sources. The main crop of potato planted in April-May, 1945 had a very advance start as a result of drought during the sprouting period. North-east monsoon rains were normal in Ootacamund and Gudalur taluks and above normal in the Coonoor taluk with the result that the second crop of potatoes in the last taluk suffered from disease and rotting.

Though the total amount of rainfall received during the year in Coimbatore and Salem districts was above normal, its distribution was abnormal. The south-west monsoon rains during the months of June and July were very insufficient for sowing the dry land crops in the right season but fairly good rains were received in the months of August and September which helped the crops well but the heavy north-east monsoon rains of October and November interfered with the young crops of cotton and the maturing crops of cholam, cumbu and groundnut. The months of January-February were rainless and the dry land crops suffered in consequence. The heavy rains from October to December helped to fill up irrigation tanks and wells to their maximum capacity and assured enough supply for a second or third crop of paddy under tank ayacuts, and for crops under wells in the summer of 1945.

The failure of sowing rains in the summer months of April and May and the holding off of the south-west monsoon rains in June delayed sowings of dry land crops, particularly in the Salem district.

The season on the whole in Coimbatore was quite fair and only just fair in the Salem district.

CROPS.

(a) Cereals.

1. *Paddy*.—As usual, this most important food crop received increased attention at the hands of the district staff during the year under report. The extension of the area under high yielding pure strains, the reduction of the quantity of seed sown per acre and the correct number per hole and the spacing of seedlings and the popularisation of green manures, oil-cakes and ammonium sulphate, bonemeal and superphosphate in correct doses received prominent attention.

For the large scale multiplication of seeds of the improved strains 1,250.77 acres were grown under seed-farm conditions during the year and as a result it was possible to distribute 436,131½ lb. of seed from the departmental depots. These improved strains, about 45 in number, the cultivation in the division, are estimated to have covered 304,798 acres as against 280,036 acres of the previous year, so far out of roughly 18 lakhs of acres under paddy in the division. Above five-sixths of the area still remain to be covered.

Reserve paddy scheme in Malabar.—In addition to the stocking of the seeds of improved strains, a reserve paddy seed scheme was started in the year in Malabar district to meet unforeseen demands for seeds as a result of the district-wide rationing as well as possible destruction of crops by flood, drought, and insect pests and diseases. Twenty-three lakhs, six thousand three hundred and sixty-seven pounds of seeds were purchased and stocked during the year in different parts of the district of which 192,513 lb. were distributed to ryots by the close of the year.

Reduction of seed rate and economic planting.—Thin sowing of paddy nurseries was demonstrated in 1,010 cases, and 188,310 acres were planted economically as against 138,469 acres of the previous year.

Manuring.—Sixty-thousand seven hundred and thirty acres were green manured as against 49,177 acres of the previous year. Striking progress was made in the popularisation of the use of the oil-cakes and artificials in manuring paddy crops during the years as 117,805 acres were manured with these against 33,790 acres in the previous year.

Thirty thousand nine hundred and seventy-one pounds of seeds of various green manures, 1,828 tons of artificials, 7,218 tons of oil-cakes and 79½ tons of other manures were sold during the year from the several Agricultural depots in the division.

2. *Cholam*.—A.S. 29, 389, 1575, 2095 and 3313 are the strains that have done well in this division. The area under them is increasing. Twenty-eight thousand eight hundred and forty pounds of seed of these strains were distributed during the year. Twenty-four thousand four hundred and eighty-seven acres have so far been covered with them against 23,492 acres of the previous year.

3. *Ragi*.—E.C. 593 and 3517 are the two strains that have become popular in this division. On the Mysore border in Salem district H. 22 a Mysore strain is also getting established as a high yielding strain. Twelve thousand eight hundred and eighty-five pounds of seed were distributed during the year under report. Large scale multiplication of E.C. 593 ragi seed is being carried out in the Salem district to cover a very large area under ragi in it. These strains have already covered 57,253 acres against 54,988 acres of the previous year. It is hoped that in the course of the

next two or three years a substantial part of the area under ragi in the division would be under the above strains.

4. *Cumbu*.—P.T. 700 and 367 are becoming popular in Salem district while P.T. 700 and 2229 are gaining favour in the Coimbatore district. Four thousand two hundred and sixteen and a half pounds of seed of these strains were distributed by the department during the year. The estimated area under these strains is 13,057 acres as against 7,921 acres of the previous year. The most important thing in the spread of cumbu strains is the cultivation of a strain in one or more villages in block and to the exclusion of all other varieties to ensure purity and large bulk of pure seed for wholesale replacement of all other kinds in blocks of villages. This point is being stressed at every opportunity.

5. *Wheat*.—Four thousand two hundred and seventy-four pounds of wheat seed were distributed during the year. The wheat rust scheme was in force on the Nilgiris till the 15th September under which the sowing of wheat and barley was effectively prohibited till that date. I.P. 80-5 and I.P. III wheat strains were distributed in the Nilgiri district during the year. Federation wheat introduced five years ago in the Nilgiris have covered about 100 acres.

6. *Barley*.—One hundred and fifty-seven pounds of barley were distributed during the year in the Nilgiris.

7. *Rye* was grown by a few cultivators on the Nilgiris for the production of ergot by the Government Entomologist.

8. *Oats*.—Thirty pounds of resitant oats were distributed in the Nilgiris.

(b) *Fibres*.

Cotton.—Cotton forms the most important fibre crop in the districts of Coimbatore and Salem in this division. Cambodia and karunganni are the main varieties grown.

Co. 3 seed multiplication scheme in the Salem district financed by the Indian Central Cotton Committee has been in its four year. Four hundred and ninety-four acres of inner seed farms and 3,652 acres of outer area seed farms were run during the year under report. Seventy-eight thousand three hundred and fifty-four pounds of Co. 3 seed were distributed. Co. 3 strain has so far replaced Co. 2 and ordinary cambodia cotton in about 13,423 acres in the Salem district.

Among the cambodia strains Co. 2, 920 by 4,463 and among karunganni strains K. 1 and C. 11/2 are the ones that are in cultivation in the Coimbatore district. Seed farms of these were run to multiply seed of these, 4,142 acres under Co. 2, 413 acres under 920 and 97 acres under X4463 and 1,000 acres under K. 1 and 240 acres under CH. 2 were grown under seed farm conditions during the year under report.

On the whole 6,02,690 lb. of seed of cambodia strains and 57,890 lb. of karunganni strains were distributed during the year.

The total area under cambodia strains was only 1,51,848 acres against 2,17,381 acres of the previous year and the total area under karunganni strains was only 51,525 acres against 80,263 acres of the previous year, showing considerable shortage in the area under both the varieties of cotton.

Twenty-six thousand two hundred and eighty-five acres are estimated to have been line sown during the year.

(c) *Sugarcane*.

Coimbatore, Salem and South Kanara are the districts in which sugarcane is grown on an extensive scale. The area under this crop in Malabar is very small and in the Nilgiris district practically nil.

Among the improved strains grown, Co. 419 occupies a pre-eminent position in all the districts. Co. 413 and Co. 421 are the other strains under cultivation on a small scale.

Eight lakhs forty-seven thousand six hundred and twenty-five setts were distributed for planting during the year.

It is estimated that there are 23,608 acres under these canes in this division.

Five thousand eight hundred and five acres were planted on improved lines. Seven hundred and twenty improved furnaces constructed and 135 demonstrations held in the preparation of good jaggery.

Due to the continuance of the ban on the export of viscous jaggery in the South Kanara district, the special demonstration staff consisting of one fieldman and five maistries was engaged during the year for three months for the demonstration of the preparation of solid jaggery in the place of the viscous variety.

(d) *Fodder*.

The propaganda for growing fodder crops was kept up. One thousand five hundred and one pounds of lucerne seed, 100 lb. of naize seed, 205 lb. of kolukattai grass seed, 8½ lb. of napier grass seed, 21,150 guinea grass slips and 7,900 napier grass slips were distributed during the year.

(e) *Fruits*.

People in general are getting more and more interested in establishing fruit orchards partly as a result of the demand for fruits of all kinds created by the "Eat More Fruits Campaign" and partly by the very high prices ruling in the market for fruits. In addition to wide spread propaganda for planting fruits, sites were inspected in many cases and advice given regarding spacing, manuring and general management of orchards.

Six hundred and fifty-three sapota plants, seven lime plants, 2,285 mango grafts, 356 plantain suckers, 12 jack seedlings, 11,845 pure apple suckers, 1 oz. of papaya seed and 6,380 plants of miscellaneous kinds were distributed during the year.

It is estimated that 3,635 acres were grown with fruit plants during the year.

(f) *Vegetables.*

Potatoes.—Potato is a major crop in the Nilgiris district while it is grown in a few hundred acres in Hosur taluk of the Salem district in this Province. 20,482.25 acres were under this crop in the Nilgiris, of which 20,000 acres were under the 'Great Scot' variety while Salem had 410 acres under potatoes.

47.88 acres of seed farm were run by the department during the year in the Nilgiris to multiply seed tubers.

1,17,928 lb. of seed potatoes were distributed in this division during the year. 2,600 tons of seed were made available from the Nilgiris to different provinces and states besides 72,629 lb. supplied to other districts within the Province.

Basing on the results of several years experiments on the Agricultural Research Station, Nanjanad, a scheme to induce potato growers in the Nilgiris to plant medium sized tubers of (1½ to 2 oz.) in the place of 'chats' they now use for planting the entire area under this crop was submitted to the Director of Agriculture during the year as the acre yields thereby could be increased by 100 maunds (a maund = 25 lb.). Before launching such a big and costly scheme, field trials were asked to be conducted in about 10 acres during the main crop season. Accordingly 25 trial plots have been laid out in Ootacamund and Coonoor taluks in April-May of this year. The results of this trial will be available for incorporation in the next year's report only. However, as a result of propaganda, it is estimated that 2,000 acres were grown with medium sized tubers by the ryots.

The scheme to supply table potatoes to the military was running for a second year in Hosur taluk of Salem district during the year. Four hundred acres were under the crop and a total quantity of 333 tons were supplied.

Manure mixtures of different kinds were stocked by several manure firms in large quantities. The quality of the mixtures had greatly improved and the prices charged were also reasonable.

English and Indian vegetables.—Great emphasis was laid on the extension of the area under vegetables of all kinds during the year in the departmental propaganda. As a result of this intensified propaganda it is estimated that 6,850 acres were grown with vegetables. One hundred and forty pounds and 9 oz. of English vegetable seeds and 1,069 lb. 8 oz. of indigenous vegetable seeds besides 7,778 packets of assorted vegetables were distributed.

Four pounds 5 oz. of tomato seeds and 12 lb. 8 oz. of chilli seeds and 1,00,000 of sweet potato and 43,211 tapioca cuttings were also distributed.

The special staff for increasing the production of vegetables for civilian consumption near big towns in Coimbatore and Kozhikode were continued though in Coimbatore there was only a maistry during the major part of the year as the Agricultural Demonstrator in charge was withdrawn for work elsewhere.

Indian vegetable scheme in Coimbatore district.—The scheme for cultivation and supply of Indian vegetables to the army by the department started in May 1944, was in full working throughout the year. A total quantity of 11,12,373 lb. of vegetables, 2,294 coconuts and 207 lb. of tamarind was delivered to the army during the year. The scheme has been extended for another year from 1st April 1945.

Indian vegetable scheme in Salem taluk.—This scheme has been running for the second year. A total quantity of 324 tons of vegetables was delivered to the military during the year. More and more cultivators are coming into the scheme for growing and supplying the vegetables.

The Exotic Vegetable Scheme, Hosur.—This is the second year of the scheme. Nearly 1,300 tons of English vegetables were supplied to the military in the course of the year.

3. *Onions.*—The demand for onions, particularly for Bellary onions from the army and the dehydration factories has increased considerably. A scheme for growing Bellary onion in 1,000 acres in Coimbatore district was submitted during the year. It has just been sanctioned.

One thousand three hundred and fifty-five pounds of Bellary onion seeds were distributed and 1,276 acres were under this crop during the year against 704 acres of the previous year.

(g) *Oil seeds.*

Groundnut is grown as major crop in the districts of Salem and Coimbatore while it occupies a few thousand acres in Malabar and South Kanara districts of this division. A.H. 25, 32 and 698 are the strains grown. Ten thousand and eleven pounds of seeds of these were distributed during the year. So far 2,094 acres have been covered by them against 1,725 acres of last year.

2. *Coconut.*—Out of a total of 6,05,764 acres under coconut in this Province, 4,35,579 acres are in this division, of which over 4 lakhs of acres are in Malabar and South Kanara districts. As the price for coconut and coconut oil continued to rule very high throughout the year, the growers are paying much more attention to this crop in intercultivating and manuring the crop. In fact the departmental propaganda about the above two items carried on incessantly during the past so many years is now bearing fruit.

Eleven thousand five hundred and seventy-three acres were properly bunded and intercultivated under the direction of the departmental staff during the year. Besides a supply of 833 seed nuts and 1,785 seedlings from coconut stations, 2,000 seed nuts and 2,500 seedlings were supplied through reliable private garden owners. It is hoped that the Central Coconut Committee that was constituted during the year would be intensifying research work on this important oil seed crop of the west coast of India in all directions.

3. *Gingelly*.—S.I. 89 is the gingelly strain that is finding favour with the growers in this division. Five hundred and thirty-eight pounds of seed of this strain were distributed during the year. Four hundred and fourteen acres are now under this strain and it is hoped that a very much bigger area would be covered by it hereafter.

4. *Castor*.—This crop is rarely grown as a bulk field crop but is generally grown mixed with other crops or a crop on borders and bunds of fields. Strain R.C. 59-2-1-1 is becoming popular in Coimbatore district. One hundred and eighty-three pounds of seed were distributed during the year.

(h) *Pulses*.

Pulses.—The acute shortage of pulses, particularly black and redgram in the Province is brought home to the cultivators and vigorous propaganda is kept up for increasing the area under pulses. One hundred and sixty pounds of greengram, 298 lb. of redgram, 1,585 lb. of bengalgram, 1,771 lb. of horesegram, 5,795 lb. of blackgram and 21 lb. of soya bean and 2 lb. of other miscellaneous pulse seeds were distributed during the year. The scheme for the free distribution of pulse seeds initiated by the Pulses Specialist during the year is also expected to encourage their cultivation on a bigger scale.

(i) *Miscellaneous*.

Seeds of the following varieties of crops were supplied during the year under report :—

	LB.	OZ.
Korrukkapuli seeds	154	
Cassia siamia	8	
Clove seeds	23	
Cashew nuts	1,412	
Prosopis juliflora	15	3½
Kapok seeds	34	10
Miscellaneous seeds of other kinds	34	
Arecanut seeds	80	
	Nos.	
Areca seedlings	400	
Pepper cuttings	1,000	

B. IMPLEMENTS.

The scarcity and high cost of implements of all kinds continued during the year under report. To counteract the rise in price and to put down black market in agricultural implements, the department undertook the task of stocking and selling standard and non-standard steel and iron at controlled rates from the several Agricultural Depots and sub-depots for making tools and implements by the cultivators. In addition, local fabricators were supplied iron and steel for manufacturing agricultural implements and selling at controlled rates. The number of demonstrations conducted and sales effected is given below :—

Variety.	Sale.	Demonstration.
Mould-board ploughs	204	2,606
Other labour-saving implements	52	976
Spare parts	1,463	
Chaff-cutters	2	62
Cane mills	6	
H.M. Guntaka		14
Roll easy mhote wheels and rollers.	74	596
Guntaka—ordinary		5
Under trading schemes—		
Mammattis	1,827	
Pick-axes	887	
Crow bars	163	
Sickles	70	
Country plough shares	2,449	
Hand-hoes	9	
Digging forks	17	1
Tools and implements	811	
Iron sheets, plates, flats, bars, rounds, etc.	577 tons and 1,778 lb.	

C. MANURES.

The need for conserving cattle manure including urine and the conversion of all organic waste material into compost to augment the supply of manure with the cultivators was brought home to the ryots by intensive propaganda. As a result, 5,585 new manure pits were dug, 311 old pits were rectified and 4,685 pits were covered with silt. Municipal rubbish and night soil were composted in 204 demonstrations. One thousand six hundred and thirty-nine compost pits and heaps were laid. Application of dry earth and litter in cattle sheds to conserve urine was carried out in 4,999 cases while 1,237 pits for collecting cattle urine were also dug.

2. *Green manures*.—The use of green manures for crops has become well understood by the cultivators and the demand for

seeds has become so great that the available supply is not enough to meet a fraction of their demand. Collection of green manure seeds was insisted on in all places.

Following are the quantities of seeds of various kinds supplied during the year :—

	LB.
Kolinji	11,606
Sunn hemp	16,545
Daincha	7,610
Pillipesara	3,488
Indigo	1,676
Sesbania S; eciosa	46
Glyricidia maculata	2
Lupins	20

3. *Concentrated fertilisers*.—Great progress was made in the stocking and sale of concentrated fertilisers during the year from the taluk and village sub-depots. One thousand eight hundred and twenty-eight tons of artificials like ammonium sulphate, ammonium phosphate and superphosphate, 7,218 tons of oil cakes, mostly groundnut cakes, 79½ tons of other miscellaneous manures were sold.

The Government Training Scheme was responsible for such big turn over. In fact the trading scheme coupled with the grant of large sums of money as interest-free loans have raised the prestige of the department among the farming community never dreamt of before.

D. PESTS AND DISEASES.

Control of pests and diseases.—The common insect pests that cause damage to crops in this division are paddy stem borer, rice bug, rice hispa, paddy thrips, swarming caterpillar, 'Surai' mealy bug, cholan ear-head bug; aphids on vegetables, epilachina beetles on brinjals, shoot and fruit borers, nephanthis serinopa on coconuts, coconut beetles; hairy caterpillars on groundnuts and millets, thrips on chillies; while among diseases, blast on paddy, wilt on betel vines, mildew on grape vines, bud-rot of palms, mahali on arecanut trees, gummosis and die back of fruit trees, bleeding disease of coconut, and ring disease of potatoes are the common ones.

Though all the above insect pests and diseases were noted to do damage, the outbreak of any of these was not severe.

Scheme for the control of nephanthis serinopa on coconuts.—The staff for breeding and liberation of parasites on nephanthis serinopa in Malabar and South Kanara was continued during the year. Nine lakhs six thousand eight hundred and sixty-five parasites were bred in the laboratories and liberated during the year, besides the removal of affected leaves from 11,444 trees.

Mahali disease on arecanut.—Preventive spraying against mahali disease on arecanut has become a routine practice among the arecanut growers of South Kanara and to a less extent among the growers in South Malabar. In all, 12,500 sprayings were done during the year.

The following were the demonstrations of spraying carried out during the year :—

Mahali disease spraying	12,500
Treatment of nephanthis serinopa	11,444
Treatment of orange for die-back on fruits	2,177
Spraying and dusting	4,119
Treatment of coconut stem-bleeding disease	1,084
Number of trees traced for budrot	7,622
Spodoptera pest control demonstration	100
Spraying against Chilli thrips	1,500 plants
Hand-netting and hand-picking of insects	4
Copper sulphate treatment	3

2. *Pest Act*.—Cotton Pest Act was successfully enforced in the districts of Coimbatore and Salem. There were no prosecution.

Bud-rot on coconuts and palmyra.—The Madras Agriculturists Pests and Diseases Act was enforced in the three taluks of Palghat, Walluvanad and Ponnani. The special staff visited 362 villages and traced out 7,622 diseased palms, conducted demonstration and trained coolies to do the work efficiently.

The Sub-Assistant in Mycology in charge and a senior demonstration maistri were deputed to the West Godavari district for a fortnight to study the methods of operation against bud-rot disease.

Wheat rust.—The supervision of the cultivation of wheat and barley during the first season April-September was effected as per the Pest Act during this year also. The stubbles of previous crop and self sown plants were burnt and the special staff appointed for this work intensively toured in the villages, educated the ryots to develop a "clean up" consciousness and prevented fresh sowings of wheat and barley.

E. DEMONSTRATIONS.

One thousand and two hundred demonstration plots and 461 trial and observation plots were laid out during the year to find out the superiority of the strains or crops of the cultural methods advocated by the department.

F. WORK WITH OTHER DEPARTMENTS.

The District Agricultural Officers and their staff kept close contact with the officers of the Public Works Department, Public

Health, Revenue, Co-operation, National War Front, Veterinary and Education Departments and participated in all meetings and conferences, jamabandi camps, for joint effort in War Fronts and Food Production Campaign.

G. EXHIBITION AND SHOWS.

Ninety-eight Agricultural Exhibitions and Shows were put up during the year and 20 lectures with magic lanterns and 4,274 without lanterns were delivered on various agricultural problems.

H. AGRICULTURAL ASSOCIATIONS.

Twenty-three fresh associations were started during the year. On the whole, 208 associations were functioning in the circle. Four hundred and seventy-two meetings were held and suitable action taken on the resolutions passed at those meetings.

I. LIVESTOCK.

Propaganda regarding proper feeding of milch and work cattle was carried on by the District Staff and help was rendered in getting supplies, seeds of fodder grasses, eggs and birds of improved breeds of poultry.

J. SIDE LINES AND COTTAGE INDUSTRY.

Propaganda for popularizing bee-keeping was kept up to stimulate interest in Agriculture, and Honey Week was celebrated as in previous years. Four hundred and eighty-seven demonstrations in hiving wild colonies, 722 demonstrations of correct methods of honey extraction were done during the year. Twenty bee-hives were sold to the public. Nearly 1,232 bee-hives were working during the year.

K. LOANS.

Rupees one thousand eighty were granted to 42 loanees for the purchase of various agricultural implements.

Rupees ninety-six thousand one hundred and sixty-five were granted as loans for the purchase of seeds and manures to 1,746 ryots during the year. The loans were given in kind. These interest-free loans are increasingly being taken advantage of by small ryots.

L. PUBLICATIONS.

The free distribution of the Tamil monthly journal, " Meshi-selvam ", introduced during the year, has become very popular among the cultivators. Nine hundred and thirty-two copies of village calendars, 203 other priced publications besides the free distribution of leaflets, posters, etc., were sold during the year.

M. CONTROL OF SOIL EROSION.

The danger of neglecting anti-soil erosion methods was prominently brought to the notice of the cultivators and methods to be adopted for the prevention of soil erosion, were demonstrated wherever possible.

Contour planting of potatoes to prevent soil erosion was demonstrated in 2,100 acres. One thousand eighty-four acres were terraced, 1,765 acres were bunded, 883 acres were levelled; gully plugging was carried out in 1,120 acres. Six hundred and twenty-five acres were contour ploughed. Silt trapping was done in 269 acres and field embankments were put up in 674 acres.

One thousand four hundred and three acres were planted with hedges and trees and 20,000 blue gum seedlings were planted in 75 holdings.

N. GROW MORE FOOD CAMPAIGN.

Propaganda to increase food production was carried on vigorously by the District Staff during the year. Every attempt was made by them to reach the targets fixed for each item of work under the food and vegetable campaign. The District Staff formed 120 food committees and attended 1,714 public and War Committee meetings and delivered 4,234 lectures on Grow More Food Campaign, explaining the several concessions granted by the Government, and requesting the ryots to avail of the interest-free takkavi loans, free distribution of seeds and manures. Special stress was laid on the conversion of waste lands into cultivation, on the changing of single-crop into double-crop lands, adequate manuring of food crops and on the use of high yielding strains. Large scale multiplication of seeds in seed farms were started to meet the increased demand. Special schemes for the supply of English and Indian vegetables started before were continued to be run to meet the demand of the military.

Prizes to the value of Rs. 810 in the shape of seeds and manures were awarded to few agriculturists and agricultural associations out of the Discretionary grant of the Collectors of the several districts. Seeds and manures to the value of Rs. 5,911 were distributed free to 292 poor and deserving ryots during the year.

The starting of the State Trading Scheme has very much helped the ryots to get the manures and iron at controlled prices from the departmental depots and the quantities of different kinds of manures distributed to ryots through the departmental depots, are given below:—

	LB.
Groundnut-cake	8,735,915
Cake meal	169,551
Bonemeal	137,595
Fish manure	49,728
Ammonium sulphate	4,013,815
Ammonium phosphate	63,912
Castor cake	38,640

The various concessions granted by Government, in the matter of assessment and irrigation facilities, to bring new areas under food crops, the free issue of seed and manure, the interest-free *takkavi* loans for the purchase of manure and implements, were of immense help in the successful pushing on the Grow More Food Campaign. In achieving this result the hearty co-operation of all Government Departments, was readily available.

The District Staff participated in all War efforts in the circle and aided the other departments in the collection of war funds, in addressing meetings on recruitment, savings campaign, etc. Out of Rs. 4,09,155-12-0 collected for War Funds in this circle, Rs. 3,97,500 relates to collections towards war bonds in South Kanara district. In this connexion, special attention has to be made of Sri M. D. Prabhu, who as the Agricultural Demonstrator, Mangalore, was solely responsible for the collection of the amount. He was awarded the first prize in recognition of this work by the Collector of the district.

The Madras Manure Dealers' Licensing Order of 1943 was in force during the year under report and 465 licences were issued.

IV. AGRICULTURAL RESEARCH STATIONS.

(1) Agricultural Research Station, Taliparamba.

Season and Rainfall.—The total rainfall recorded for the year was 119.97 inches as against 148.60 during the previous year. Although the south-west monsoon set in early in June it was feeble till about the end of August. This was not conducive to plantation crops. The north-east monsoon though late was favourably distributed and continued till about the third week of December. The field crops were normal but the late rains of December delayed the flowering of mango and jack. The succeeding hot weather rains were insufficient and the long period of dry weather from January 1945 to May delayed the preparatory cultivation and sowing of crops of the current year. The regular monsoon of 1945 started only in the first week of June. The season has not been favourable for the pepper and fruit crops.

2. Crops—Dry land—Modan paddy.—Five varieties of dry paddy were under cultivation as pure and catch crops. The variety Black Modan gave an average acre yield of 773 lb. as against 440 lb. of the previous year.

Ginger.—Very little seed was available for planting as the material got damaged during the storage. The available seeds of Bengal ginger and Ernad were planted and gave fourteen and eleven fold respectively.

Chillies.—An area of 2.35 acres was planted with chillies and an acre yield of 500 lb. of dry chillies was obtained. Seeds

of South Malabar, South Kanara and Pusa varieties were selected for distribution. Six hundred and thirty-six tolas of seeds and 58,256 seedlings were distributed.

Turmeric.—This occupied an area of 50 cents between coconut trees. An acre yield of 5,880 lb. of fresh rhizome was obtained as against 690 lb. of last year.

Fodder.—Cumbu grown in 50 cents in coconut garden yielded 7,700 lb. of green fodder per acre as against 10,890 lb. in the previous year.

Horsegram.—After Modan paddy sown in an area of 3.25 acres gave an acre yield of 479 lb. as against 406 lb. last year.

Groundnut.—A.H. 25 and A.H. 45 tried in 25 cents and 35 cents respectively, gave the following acre yield compared with the previous year:—

	1944-45.	1943-44.
A.H. 25	1,320 lb.	2,024 lb.
A.H. 45	800 lb.	1,501 lb.

Wet land.—Four varieties of paddy were grown applying 112 lb. bonemeal per acre and also Kolinji green manure ploughed in situ. The average acre yields for the five years and for the current year are given below. P.T.B. 9 of this year has not fared well. Rajakayama gave 12 per cent increased yield.

Variety.	Average acre yield in lb. for the past five years.	Acre yield in 1944-45.
P.T.B. 9	2,333	2,391
P.T.B. 8	2,243	2,250
Rajakayama	1,979	2,228
Kurumkayama	2,478	2,485

Nineteen thousand two hundred and sixty-two pounds of paddy seeds were distributed.

Sugarcane.—The crop was raised in an area of 52 cents including 27 cents ratoon. The variety Co. 419 yielded 5,678 lb. jaggery per acre in the ratoon crop and 6,264 lb. in the plant area. Co. 408 gave a higher tonnage of cane in both the ratoon and plant crops.

Arecanuts.—The yield during the year was 60,879 nuts from 191 trees. The irrigated plants were more vigorous and yielded better.

Garden land—Pepper.—Crop was very poor due to unfavourable weather condition and the yield was 497 lb. of dry pepper against 3,405 lb. last year. In the varietal plots the Travancore varieties in general performed better and 110 flowered out of 180 planted. The *Erythrina Indica* standards were found to be superior in respect of the growth of standards as well as the vigour of vines planted.

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Coconuts.—Intercultivation alone was given to the plots during the year. Thirteen thousand and twenty-seven nuts were harvested against 9,853 last year.

Vegetables.—Rainfed and irrigated crops were grown and 2,707 packets (tolas) of seeds and 750 seedlings were sold.

3. **Fruit nursery and horticultural work.**—This work has continued and the following plants were distributed from the nursery:—

Mango grafts	...	...	...	...	2,210
Sapota	...	...	...	...	157
Other fruit plants	...	...	...	...	666

Banana trials.—Ten varieties were grown for trial. Mauritius was found to be shortest duration variety and 'Kao' the longest.

Pine-apple.—The crop was rather poor. Seven hundred and forty-five suckers were distributed.

Mangoes.—Different propagation trials were continued. Three thousand and ninety-eight pounds of fruits were sold as against 1,061 lb. during last year.

Jack.—A trial was made to inarch jack to one year old jack seedling rootstocks with satisfactory result.

Mangosteen.—Nine out of 13 trees flowered. The drought in the months of February, March and April delayed flowering and the subsequent heavy rain at the time of flowering caused shedding of fruits.

4. **Condition of cattle.**—The condition of work animals deteriorated during early part of the year, but improved appreciably towards the end of the year after increasing their ration by 20 per cent. One buffalo calved during the year.

Ensilage.—Fourteen thousand pounds of good quality silage was prepared from 25,000 lb. hill grass and fed to cattle during the summer months.

5. **Sales.**—The following sales of farm produce were effected during the year:—

Paddy seed	..	..	..	..	19,262 lb.
Groundnut seed	..	..	..	..	23 "
Chilli seeds	..	..	..	..	636 tolas.
Vegetable seeds	..	..	..	..	2,707 "
Pepper cuttings	..	..	..	..	3,740 Nos.
Chilli seedlings	..	..	..	..	58,256 "
Brinjal seedlings	..	..	..	..	750 "
Mango grafts	..	..	..	..	2,210 "
Sapota grafts	..	..	..	..	157 "
Pine-apple suckers	..	..	..	..	745 "
Other fruit plants	..	..	..	..	666 "

(2) Agricultural Research Station, Nanjanad.

Season and rainfall.—A total rainfall of 54.87 inches was recorded during this year which is just the average for 25 years. The rainfall received was normal during south-west monsoon, above normal during the North-east Monsoon and below normal during the hot weather period.

Potatoes.—(i) **Bulk area.**—The main and second crop potatoes planted in 1944 and the irrigated crop during 1945 yielded 7,986, 6,698 and 2,323 pounds per acre respectively, which were 7, 11 and 69 per cent below the average of the previous seasons.

(ii) **Experimental works.**—(a) **Manural experiment.**—Addition of ash to the emergency mixture for potatoes at 1,000 and 2,000 lb. per acre did not increase the yield. Yields lower than control plots were recorded but they were not statistically significant.

(b) **Sprouting experiment.**—Potato tubers sprouted naturally, tuber sprouted with the help of carbon-bi-sulphide and tubers with the skin peeled off (were planted and the yields compared). Tubers sprouted by treating with carbon-bi-sulphide gave best yields and those with their skin peeled off gave the lowest yield.

(c) **Comparative study of the performance of tipis versus whole tubers.**—As was observed in previous seasons two ounce whole tubers gave the best yield.

(d) **Soil erosion agronomic experiment.**—Plots cultivated according to the farm method of cultivation gave poorer yields of potato and samai than those of ryot's methods. But the results were not statistically significant.

(e) **Experiment on the control of ring disease of potato.**—This is the third year of the experiment. All the plots showed a fall in PH. value irrespective of various treatments. Plots treated with sulphur did not show any marked increase in the yield of potato or a comparatively low incidence of ring disease. Nothing definite can be said at this stage.

(f) **Utilization of insect attacked tuber.**—Sound tubers and insect attacked tubers treated with carbon-bi-sulphide when planted did not show any difference in yield. It can be inferred from this that tubers attacked by potato tuber moth can also be utilized as seed.

(g) **Treatment of potato seed tubers with insecticides.**—Acorous, pyrethrum, derris and tobacco were found effective in arresting the potato tuber moth attack in storage in the order mentioned above.

(h) **Black heart disease.**—Table potatoes when stored under two sets of conditions, one similar to the conditions existing in the potato godowns at Ootacamund and Mettupalayam and the other with ventilating devices, no "Black Heart" was observed in the potatoes in storage under both the conditions.

(e) *Varietal studies*.—Great Scot was tried in preliminary comparative trials with two Hybrids and two cultures received from Simla and this proved to be better than anyone of them in yield.

(f) Simla Hybrids were multiplied for seed purposes.

2. *Oats*.—IP 1, IP Hybrid 1 and IP Hybrid 3 received from the Imperial Economic Botanist, New Delhi, were tried and gave poor yields of grain.

3. *Wheat*.—This crop failed as it was sown in the second crop season when the damage due to frost was observed.

4. *Barley*.—Strain No. IP. 13 recorded an acre yield of 150 lb. of grains.

5. *Rye*.—Ergot production was attempted in 18.26 acres. An acre yield of 15.2 lb. of Ergot and 129 lb. of grain was recorded.

6. *Ragi*.—Comparative trials of ragi varieties (bulk selections) conformed the results of last season. Nanjanad sample 2, a selection from a bulk sample obtained from Nanjanad during the year 1943, was best. The crop of ragi grown in the non-experimental area gave 640 lb. of grain per acre.

7. *Samai*.—Samai selection (made from sample No. 2 obtained from Nanjanad during the year 1943) gave better yield than the local and the selection made from the sample No. 1 in the comparative trial. The crop was not raised in the non-experimental area.

8. *Green manure crops*.—Sweet Lupin (*Lupinus Angustifolius*) was raised for seed in 7.54 acres and gave only 96 lb. per acre due to unfavourable climatic conditions. Varieties of *Lupinus* (*Lupinus termis*, *Lupinus leutes*) grown for green manure in 12.12 acres gave an average 5,300 lb. of green matter per acre.

9. *Pyrethrum*.—Experiments are laid out to study (i) the effect of manuring; (ii) varying the time of planting; (iii) pruning the plants in different months and to various heights; (iv) adopting different spacings and (v) using slips instead of seedlings on the yield and pyrethrin content. The results were not conclusive. The normal trials however indicated in general that addition of phosphates in the form of a combination of bonemeal and super increases the pyrethrin content.

Selection work and crossing pyrethrum with paris and white daisies were continued. The seeds from the crossed heads had practically no viability as they failed to germinate when sown in field No. 4.

10. *Soil erosion run-off plots*.—The usual observations were made. The results obtained are in conformity with those of the previous years. The run-off of rain water and silt lost were the highest in the fallow plot and minimum in the plot where indigenous grass was grown.

11. *Rotation experiment*.—This is the fourth year of the experiment. It has to be continued for two more years before the advantageous of any particular rotation can be assessed and advocated extensively.

12. *Trial crops*.—The following crops were tried with a view to find out their suitability to the tract and extension on a large scale if found useful. No conclusions can be drawn at present.

Name of crop.	Object.
(i) Mustard (upcountry varieties).	To replace the locals.
(ii) Perennial castor	To exploit the possibilities of increasing the oil supply in the hills.
(iii) Linseed	To exploit the possibilities of increasing the oil supply in the hills and also as a source for fibre.
(iv) Clover	To study the formation of good pasture land.
(v) Thin Napier grass	Do.
(vi) Wyne grass (the grass that fights snakes).	To study the usefulness of the grass in eradicating mosquito nuisance.
(vii) Giant star grass	To study the soil binding property of the grass.
(viii) <i>Millitia pachycarpa</i>	Source of "rotenon" (or principle which has highly insecticidal values).
(ix) <i>Digitalis</i>	Source of "digitalis"—a valuable drug.
(x) Scented geranium	To exploit on the possibilities of preparing scent.
(xi) Mint	As a source of essential oil.
(xii) <i>Acorus</i>	Possibility of using it as an insecticide.
(xiii) <i>Rosa Maris officinalis</i>	A source of essential oil.
(xiv) <i>Thymus vulgaris</i>	A source of essential oil for culinary purposes.

13. *Vegetables*.—Seed production was attempted with vegetables usually cultivated in the Nilgiris, both English and local. Success was achieved in a variety of radish called celestial. It was found that to cope up with the successful seed production of English vegetables, the efforts of a wholetime staff solely detailed for it is essential. In the absence of such staff, seed production will be confined to peas in the coming years.

14. *Extension*.—The area of the farm got increased by 18.65 acres by the acquisition of 23.25 acres and relinquishment of 4.60 acres. The cultivated area of the farm was gradually increased by reclaiming 1.28 acres of scrub jungle.

15. *Livestock*.—On an average 7.06 pairs of work animals were maintained on the farm. Each pair had work for 207 days in the year. The cost of maintenance per pair per working day came to Rs. 2-5-4.

16. *Works*.—Besides the annual repairs a grain store and a block of six coolie huts for the farm labourers were constructed during the year.

COIMBATORE,
25th August 1945.

M. ANANDAN,
Deputy Director of Agriculture.

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ADMINISTRATION REPORT OF THE CURATOR, GOVERNMENT BOTANIC GARDENS AND PARKS OF THE NILGIRIS, OOTACAMUND, FOR THE YEAR 1944-45 (FASLI 1354).

Charge.—I was in charge of the Office of the Curator throughout the year under report excepting for a short period of 20 days' privilege leave from 4th December 1944, when Sri S. Madhava Rao, Assistant Curator, was in full additional charge.

2. *Government Botanic Gardens, Ootacamund*—(i) *Staff.*—Sri B. G. Narayana Menon, Nursery Farm Manager, was transferred as Farm Manager, Government Botanic Gardens, on 16th September 1944, and his place from that date till 9th April 1945 was taken up by Sri B. S. Kuppuswami, on whose transfer again to Salem Sri K. P. Kuppuswami joined duty at the Botanic Gardens as Nursery Farm Manager on 9th April 1945.

(ii) *Season and rainfall.*—A total rainfall of 47 inches was recorded in 150 rainy days against 61.6 inches received in 100 days of previous year. The heaviest fall of 1.65 inches occurred on the 13th of August 1944. The maximum and minimum temperature ranged between 86 and 55° F. and 86 and 59° F. respectively. Frost fell on 26 nights during the four months, December to March, of which 14 days were in the month of January.

The rains were below average and so unevenly distributed that the summer months were practically dry. As a result of this the extensive lawns in the lower gardens looked parched up during April in contrast with the usual green carpet-like appearance. The numerous flower beds in different portions of the gardens were however kept in very good form, by switching on all the available labour for pot watering them daily.

(iii) *The Nurseries and the Nursery Scheme.*—As a result of last year's intensive nursery programme of raising and selling reliable English vegetable seedlings in large numbers and also due to the marked increase in production of ornamental, economic, and medicinal plants which were made available to the public for sale, the Government in their G.O. Ms. No. 269, Development, dated 23rd January 1945, were pleased to extend the Nursery Scheme for another year from 9th February 1945 to 8th February 1946. As in the previous year, the items of work in the Nurseries were divided into two main sections—

(a) the vegetable side, and

(b) the ornamental plant propagation side.

(a) *Vegetable section.*—The raising of English vegetable seedlings for sale to ryots was continued and during the year under report 9 lb. 1-5/8 oz. of different vegetable seeds was sown in an

area of 30.61 cents in 195 raised beds each of 9 feet by 3 feet. In all 683 orders for 82,595 seedlings amounting in value to Rs. 988-7-6 were complied with including 8,150 seedlings transferred to Agricultural Research Station, Nanjanad.

To avoid keeping the nursery terraces idle during the months October to March when usually there is no demand for vegetable seedlings, an area of 10.88 cents was put under potatoes and an income of Rs. 199-6-0 was derived out of this.

Cabbage plants were also left to seed and the seeds of these are being collected.

(b) *Plant Propagation and glass houses section*—*Seed Propagation.*—Four pounds and 15 oz. and 333 packets of tree and flower seeds were sown under glass and in the open, and over a lakh and fifty thousand seedlings pricked out in previously prepared beds. Of this 7,512 seedlings were sold to the public, 1,475 seedlings transferred to the Sim's Park, Coonoor, and 1,125 sold to members of the Nilgiri Agricultural Horticultural Society amounting to Rs. 473-11-0 in all. Bulk of the nursery seedlings raised, over 75,000 in number, were supplied to the botanic gardens for planting at the numerous flower beds and borders.

Vegetative propagation.—Nineteen thousand two hundred and twenty-nine cuttings of various ornamental and economic plants and over 3,500 layers of carnations, camellias, magnolias, Rhododendrons, luculias, jasminums, etc., were inserted. Eight thousand two hundred and fifty-nine plants were potted, 2,403 repotted, and 1,753 top dressed. Five hundred and twenty-eight plants were obtained by division of orchids, ferns, begonias and rare succulents.

Different kinds of bulbs like begonias, narines, freesias, dahlias, lilies, etc., resting underground and in the bulb room were treated for growth and flowering at suitable intervals for keeping on a rolling stock of these plants in bloom for the conservatories and some beds in the open.

Seed and plant collection.—Six pounds and 3 oz. of tree and flower seeds was collected of which 1 lb. and 15 oz. was sold and 1 lb. 1/2 oz. sown in the nurseries for garden use. Sowing of flowers of different annuals was taken up and 1 lb. 3 1/2 oz. of selfed seeds collected. Valuable additions were also made to the existing nursery stock by purchase of seeds and plants from and outside India in addition to those obtained by exchange from the Government House and the local palace gardens. Indigenous bulbs of lilies, orchids, ferns, etc., were also collected from the wilds and downs of the Nilgiris.

The total sale proceeds due to these propagational activities in the nurseries came to Rs. 3,410-7-0 during the year under report by sale of surplus stock alone consisting of 3,343 plants, 132 bulbs, 50 lb. of jalap, 669 cuttings, 82,595 vegetable seedlings,

591 maunds of potatoes, 275 lb. of radish and cabbage, 13 lb. 13½ oz. and 242 packets of flower and tree seeds and 10,112 flower seedlings, after meeting all the planting requirements of these gardens and other Government Public Parks at Ootacamund.

(iv) *Conservatories*.—Both the conservatories were fully packed up with about 2,000 flowering and foliage plants in pots all the year round.

(v) *Planting*.—One thousand five hundred and fifty-six blue gum seedlings were planted in the sholas above the nurseries and over 500 perennial shrubs, trees, bulbs, rock plants and creepers planted at the borders, shrubberies, slopes, pond margins, rockeries and arches. Forty-four standard roses in 2½ varieties were planted in colour schemes in a crescentic bed in the lower gardens. Twenty-four briar roses were planted at intervals along the pond margin with a view to trial these into a dwarf ornamental life fence. Five small island beds were made along the slope above the main drive and planted with groups of showy bulbous plants. One hundred and thirty-five suitable plants in shrub and tree kinds were planted in the steep slope above the Bog gardens.

(vi) *Works*.—(a) Foot-paths and roads were repaired in patches and steps provided in places where they had gone off.

(b) Five cents of land was newly brought under cultivation in the lower garden nursery, and this area set apart for growing annuals for cut flowers and vegetables for seeding.

(c) Two artistic bridges were erected in the Bog gardens and two permanent pergolas constructed one in front of the public conservatory and one at the New Band Stand.

(d) The obstructing huge cupressus sempervirens tree in the flower show grounds was felled and root and stump removed as per request of the Secretary, Nilgiri Agricultural Horticultural Society. The hollow was filled in and levelled and the surface turfed over.

(e) Wooden shelters were provided for nearly a dozen rare young plants in the lower gardens.

(f) Silt was cleaned from four ponds, and the water weeds and rushes removed from the crescentic pond.

(g) Knolls and depressions in the lawns were corrected by cutting and filling wherever necessary.

(h) Underground drains were laid at the fountain terrace and its swampy condition corrected.

(vii) *Trial of medicinal and other economic plants*.—Thyme, acorus, rose mary, santolina, mint, lavender, etc., are being tried in the nurseries and efforts are being made for popularising them. Melinis minutiflora (the grass that fights snakes) is coming up well in the nursery terrace. Pyrethrum is being grown in a small scale in flower beds. Over 350 lb. of wild cherry bark, acorus, bay leaf, jalab tubers, digitalis leaves, eucalyptus gum, etc., was sold out.

(viii) *Annual repairs*.—Various items of annual repairs to residential and non-residential buildings, repairs to paths, fences and garden benches were attended to.

(ix) *General*.—The flower beds all over the gardens were as usual forked, cleaned, limed and manured and planted with flowering annuals in definite colour schemes, once for the interim season and once for the proper season. Planting of roses and creepers, spraying plants against pests and diseases, trimming hedges and edges, mowing lawns, scything, cleaning flower beds, slopes, footpaths, lawns, etc., were the routine items of work attended to besides attending on visitors for selection of plants and demonstration of plant propagation methods, identification and labelling of plants.

(x) *Sales and transfer supplies*.—One thousand two hundred and twenty-seven orders from different parts of India for seeds, seedlings, plants, cutflowers, bouquets, wreaths, botanical specimens, etc., were complied with and an amount of Rs. 7,258-0-6 was realized against 1,068 orders for Rs. 5,528-1-9 in the previous year.

(xi) *Food production*.—An area of 2.70 acres of shola land adjoining the nurseries was leased out this year also to the garden coolies and potatoes and vegetable crops were raised by them.

(xii) *Exhibitions*.—The Annual Dog Show and Flower Show run by the Nilgiri Agricultural Horticultural Society, Ootacamund, were held in the flower show grounds as usual.

(xiii) *Visitors*.—A record number of visitors came for the season this year in addition to the daily visitors from among the hill residents.

3. *Other Government Public Parks, Ootacamund*.—The other public parks were kept in good condition and with the limited labour available the routine works of planting, watering flower beds, swording grass, trimming hedges, general cleaning, and impounding stray cattle were attended to.

4. *Sim's Park, Coonoor*.—A total rain fall of 64.10 inches was recorded in 128 days as against 65.03 inches in 136 days of the previous year. The heaviest rain fall of 2.46 inches was recorded on the 20th October 1944. The period covering the south-west and north-east monsoons was very favourable but unfortunately the hot weather period proved exceptionally droughty. The maximum and minimum temperatures ranged between 86°F and 39°F respectively. Ground frost was registered on two successive nights on the 3rd and 4th of January 1945.

Condition and maintenance of the park.—In spite of a limited number of coolies due to war-time conditions the park was maintained in good condition throughout the year. As there was difficulty in getting the imported flower seeds attempts were made to collect

flower seeds in the park and these were sown in well prepared nurseries. A large number of seedlings were raised and flower beds were planted with suitable seedlings adopting colour designs in the herbaceous borders. A new footpath was opened near the IV terrace leading to the island bed. A rockery was made below the IV terrace and succulents and other rock plants and a few dwarf annuals were planted which attracted a large number of visitors during the season. After raising the footpath all along the pond margin wooden railings were provided to avoid the damage to the young *Abelia* hedge. Silt from the lake was evenly spread on the lawns and raked in to serve as top dressing and ammonium sulphate was used as liquid manure to all the roses. All the rose plants responded to this treatment and flowered beautifully well. The permanent canna bed inside the island bed was converted into a herbaceous border with annuals and perennials of different shades. All the flower beds in the IV terrace were remodelled and box edgings were provided instead of grass borders. The rustic arches were erected on either side of those beds. *Hedickium flavum* all along the lake margin was cut back and bulbs of the same were planted right up to the rustic bridge. Two hundred and fifty blue gum seedlings were planted in the orange shola in well prepared pits. A few choice ornamental plants were planted above the picnic ground behind the fernery. These have established very well and some of them were in bloom. The Assistant Entomologist carried a regular campaign against scales and aphids on roses. The footpaths were repaired whenever necessary and grass spikes were sworded as and when they appeared. The overgrown plants in the nurseries were planted in different parts of the garden. The failures along the hedge in the Agricultural Demonstrator's compound were filled in and the show room compound was weeded. The overhanging branches of trees were all cut back and parasites from trees removed.

New introduction.—Due to war conditions new plants and bulbs could not be had from the Continent. A few selected plants, bulbs and succulents were obtained from the Government Botanic Gardens, Ootacamund, the propagation of the same is in progress.

Nursery.—Propagation of plants in the nurseries was in full swing. A new terrace was opened at the bottom of the nurseries and this was divided into a number of small plots and planted with different kinds of ornamental plants and shrubs. As usual camelias, azaleas and standard roses received the best attention and the demand for the same is always on the increase. In all 360 briars were inserted and 275 roses were budded, 4,500 cuttings of different plants were inserted and a large number of seedlings were pricked.

Distribution of plants and seeds.—Two thousand five hundred and ten flower seedlings, 54 standard rose plants, 308 ornamental plants, 20 packets of flower seeds five bunches of ferns, 40 baskets

of sand, 15 bulbs, 81 bunches of flowers, 26 bamboo reeds and 28,500 lb. of grass were sold to the public, besides 92 standard rose plants, 175 bush and ornamental plants, 450 flower seedlings supplied to the Government Botanic Gardens at Ootacamund.

General.—The Director of Agriculture, Madras, inspected the park. The "Mirror Carps" stocked in the lake have already produced fingerlings. The annual repairs to the residential and non-residential buildings were completed during the official year.

Agricultural Research Station Nanjanad.—*Season and rainfall.* A total rainfall of 54.57 inches was recorded during this year which is just the average for 25 years. The rainfall received was normal during south-west monsoon, above normal during the north-west monsoon and below normal during the hot weather period.

Potatoes.—*Bulk area.*—The main and second crop potatoes planted in 1944 and the irrigated crop during 1945 yielded 7,985, 6,698, and 2,323 pounds per acre respectively which were 7, 11, and 69 per cent below the average of the previous seasons.

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(c) *Comparative study of the performance of tips versus whole tubers.*—As was observed in previous seasons two ounces whole tubers gave the best yield.

(d) *Soil erosion - Agronomic experiment.*—Plots cultivated according to the farm method of cultivation gave poorer yields of potato and samai than those of ryot's methods. But the results were not statistically significant.

(e) *Experiment on the control of ring-disease of potato.*—This is the third year of the experiment. All the plots showed a fall in value irrespective of various treatments. Plots treated with sulphur did not show any marked increase in the yield of potatoes or a comparatively low incidence of ring disease. Nothing definite can be said at this stage.

(f) *Utilization of insect attacked tubers.*—Sound tubers and insect attacked tubers treated with carbon-bi-sulphide when planted did not show any difference in yield. It can be inferred from this that tubers attacked by potato tuber moth can also be utilised as seed.

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(h) *Blackheart Disease.*—Table potatoes were stored under two sets of conditions one similar to the conditions existing in the potato godowns at Ootacamund and Mettupalayam and the other with ventilating devices. No "Black Heart" was observed in the potatoes in storage under both the conditions.

(i) *Varietal studies.*—Great Scot was tried in preliminary comparative trials with two Hybrids and two cultures received from Simla and proved to be better than any one of them in yield.

(j) Simla Hybrids were multiplied for seed purposes.

(2) *Oats.*—I.P. 1, I.P., Hybrid 1 and I.P. Hybrid 3 received from the Imperial Economic Botanist, New Delhi, were tried and gave poor yields of grain.

(3) *Wheat.*—This crop failed as it was sown in the second crop season when the damage due to frost was observed.

(4) *Barley.*—Strain No. I.P. 13 recorded an acre yield of 100 lb. of grains.

(5) *Rye.*—Ergot production was attempted in 18.26 acres. An acre yield 15.2 lb. of ergot and 129 lb. of grain was recorded.

(6) *Ragi.*—Comparative trials of ragi varieties (bulk selections) confirmed the results of last season. Nanjanad sample No. 2 a selection from a bulk sample obtained from Nanjanad during the year 1943 was best. The crop of ragi grown in the non-experimental area gave 640 lb. of grain per acre.

(7) *Samai.*—Samai selection (made from sample No. 2 obtained from Nanjanad during the year 1945) gave better yield than the local, and the selection made from the sample No. 1 in the comparative trial. The crop was not raised in the non-experimental area.

(8) *Green manure crops.*—Sweet Lupin (*Lupinus angustifolius*) was raised for seed in 7.54 acres and gave only 96 lb. per acre due to unfavourable climatic conditions. Varieties of *Lupinus* (*Lupinus terminus* *Lupinus Leutes*) grown for green manure in 12.22 acres gave on an average 5,300 lb. of green matter per acre.

(9) *Pyrethrum.*—Experiments are laid out to study (i) the effect of manuring, (ii) varying the time of planting, (iii) pruning the plants in different months and to various heights, (iv) adopting different spacings and (v) using slips instead of seedlings on the yield and pyrethrin content. The results were not conclusive. The normal trials, however indicated in general that addition of phosphates in the form of a combination of bonemeal and super increases the pyrethrin content.

Selection work and crossing pyrethrum with Paris and white laisies were continued. The seeds from the crossed heads had practically no viability as they failed to germinate when sown in field No. 4.

(10) *Soil erosion run off plots.*—The usual observations were made. The results obtained are in conformity with those of the previous years. The run off of rain water and silt lost were the highest in the fallow plot and minimum in the plot where indigenous grass was grown.

(11) *Rotation experiment.*—This is the fourth year of the experiment. It has to be continued for two more years before the advantage of any particular rotation can be assessed and advocated extensively.

(12) *Trial crop.*—The following crops were tried with a view to find out their suitability to the tract and extension on a large scale if found useful. No conclusions can be drawn at present.

Name of crop.	Object.
(i) Mustard (up country varieties)	To replace the locals
(ii) Perennial castor	To exploit the possibilities of increasing the oil supply in the hills.
(iii) Linseed	To exploit the possibilities of increasing the oil supply in the hills and also as a source fibre.
(iv) Clover	To study the formation of good pasture land.
(v) Thin Napier Grass.	Do. Do.
(vi) Wyne Grass (the grass that fights snakes).	To study the usefulness of the grass in eradicating the mosquito nuisance and study the soil binding property of the grass.
(vii) Giant star Grass	Do. Do.
(viii) Millet a pachycarpa	Source of "rotenon" (or principle which has highly insecticidal value)
(ix) Digitalis	Source of "Digitalis" a valuable drug.
(x) Scented geranium	To exploit on the possibilities of preparing scents.
(xi) Mint	As a source of essential oil.
(xii) Acorus	Possibility of using it as an insecticide.
(xiii) Rose mayinus officinalis	A source of essential oil.
(xiv) Thymus vulgaris	A source of essential oil for culinary purpose.

(13) *Vegetables.*—Seed production was attempted with vegetables usually cultivated in the Nilgiris both English and local. Success was achieved in a variety of radish called celestial. It was found that to cope up with the successful seed production of English vegetables, the efforts of a whole time staff solely detailed for it, is essential. In the absence of such staff seed production will be confined to peas in the coming years.

(14) *Extension.*—The area of the farm got increased by 18.33 acres by the acquisition of 23.26 acres and relinquishment of 4.90 acres. The cultivated area of the farm was gradually increased by reclaiming 1.28 acres of scrub jungle.

(15) *Livestock*.—On an average 7.06 pairs of work animals were maintained on the farm. Each pair had work for 227 days in the year. The cost of maintenance per pair per working day came to Rs. 2-5-4.

(16) *Works*.—Besides the annual repairs, a grain store and a block of six coolie huts for the farm labourers were constructed during the year.

OOTACAMUND,
12th August 1945.

P. A. NATHAN,
Curator, Botanic Gardens and
District Agricultural Officer.

FINANCIAL STATEMENT FROM 1ST JULY 1944 to 30TH JUNE 1945.

R Receipts—XXIX. (a) Agriculture—Agricultural Receipts.

J. 2118 N49
N50

	Government Botanic Gardens, Ootacamund.	Sim's Park, Coonoor.	Other public parks, Ootacamund.
	RS. A. P.	RS. A. P.	RS. A. P.
Botanical and other public gardens.	5,425 14 6	647 14 0	..
Miscellaneous	284 2 0	174 1 0	1,079 0 0
Rent on buildings	..	100 0 0	..
Recoveries of over payments ..	..	0 11 0	..
XLV. Stationery and printing ..	13 6 0	15 0 0	..
	5,786 13 6	937 10 0	1,079 0 0
Deduct—Refunds ..	36 9 0	..	..
Total ..	5,750 4 6	937 10 0	1,079 0 0

Charges.—40. g. Agriculture—Botanical and other public gardens.

	Government Botanic Gardens, Ootacamund.	Sim's Park, Coonoor.	Other public parks, Ootacamund.
	RS. A. P.	RS. A. P.	RS. A. P.
Salaries and other allowance— including dearness allowance.	16,024 7 0	1,722 14 0	..
Contingencies—Voted.			
Petty construction and repairs.	749 0 2	249 8 6	..
Capital outlay	296 6 0	6 6 0	..
Working expenses	12,548 15 10	5,182 14 6	843 0 0
Other contingencies	1,197 9 3	221 6 0	..
Dearness allowance	3,148 6 0	740 1 0	541 13 0
Total ..	33,964 12 3	8,123 24 2	1,384 13 0

